

**Aalto University School of Science**

**Eric Stigzelius**

# **User adoption of an online learning environment**

Master's Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Technology

Master's Thesis

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Supervisor: Matti Vartiainen Professor

Instructor: Eero Palomäki M.Sc. (Tech)

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| Author: Eric Stigzelius   |                 |                   |
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| Instructor: Eero Palomäki, M.Sc. (Tech)   |                 |                   |
| <p>Abstract:</p> <p>New emerging technologies provide teachers with new tools to support teaching. However, the use of new technologies in education is lagging behind. To understand what influences the adoption of new technologies and be able to use this information can contribute to a faster implementation and wider use of new technologies. User adoption of a new online learning environment is studied in this thesis.</p> <p>The user adoption of the new online learning environment is researched through a case-study. The data was gathered with qualitative interviews, an observation of a marketing event and results from the case company's own usability tests. In total fourteen qualitative interviews were conducted. The interviews with the users were transcribed and coded. The codes were categorized together with the observation of the marketing event according to the Unified Theory of Acceptance and Use of Technology (UTAUT) and Rogers' innovation decision process.</p> <p>Results indicate that teachers are keen to use digital material in teaching. The facilitating conditions encourage the user to use digital material. The online learning environment is perceived to improve the effectiveness of the user's job. However, the case company has an opportunity to improve the adoption process of the new online learning environment. The registration to the new online learning environment was problematic because of the user interface. The experimentation of the online learning environment was self-directed and limited to those applications the user knew about. There was a constant lack of information through the whole adoption process and some of the concepts were perceived as unclear.</p> <p>The author recommends that information about the use and the concepts of a new system should be easily available for users. Many of the challenges with the new online learning environment occurred because of lack of information. Some users had problems with the registration and the author suggests that access would be the first phase in West et al.'s implementation process. The new suggested implementation process would be in the respective order: Access, Experimentation, Technical Challenges, Integration Challenges, Increased Comfort Level, and Adaptation.</p> |                 |                   |
| Keywords: Online learning environment, adoption, implementation, TAM, UTAUT   |                 |                   |

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| <p>Referat:</p> <p>Många nya teknologier erbjuder nya sätt att stöda lärare i deras undervisning. Trots detta ligger utnyttjandet av ny teknologi inom undervisning efter. Att förstå vad som inverkar då man tar i bruk en ny teknologi, och att kunna dra nytta av denna information, kan bidra till en snabbare implementering och en bredare användning av nya teknologier. I detta diplomarbete undersöktes ibruktagande av en ny webbaserad undervisningsmiljö.</p> <p>Undersökandet av ibruktagandet av den nya virtuella undervisningsmiljön gjordes med hjälp av en fallstudie. Informationen samlades in genom kvalitativa intervjuer, observationer från ett marknadsföringsevenemang och med hjälp av testföretagets egna användbarhets tester. Totalt gjordes fjorton kvalitativa intervjuer. Därefter transkriberades och kodades intervjuerna. Koderna kategoriserades tillsammans med observationerna som gjorts under marknadsföringsevenemanget med hjälp av the Unified Theory of Acceptance and Use of Technology (UTAUT) och Rogers implementerings process för innovationer.</p> <p>Resultaten indikerar att lärarna är intresserade av att använda digitalt material i sin undervisning. Skolmiljön uppmuntrar även till att använda digitalt material. Trots att den nya webbaserade undervisningsmiljön uppfattas som underlättande och som att den effektiviserar användarens jobb hade lärarna utmaningar med den. Att registrera sig till den virtuella undervisningsmiljön var problematiskt på grund av användargränssnittet. Användarna utnyttjade inte heller alla funktioner i den virtuella undervisningsmiljön utan använde enbart de funktioner de kände till från tidigare. Information var knapp under hela inkörningsprocessen och vissa koncept ansågs oklara.</p> <p>Författaren rekommenderar att information för användningen av det nya systemet skall finnas lättillgängligt för användarna. Flera av problemen med den nya undervisningsmiljön uppstod enbart på grund av bristan på information. Registreringsprocessen måste också testas mer ingående innan ett nytt system tas i bruk. Författaren menar att registrering kunde vara den första fasen i enlighet med West m.fl. implementeringsprocess. Ett förslag på en ny process för ibruktagandet av den nya teknologin kunde vara enligt följande: registrering, experimenterande, tekniska utmaningar, integration, ökad trygghetskänsla och anpassning.</p> |                  |                             |
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Espoo 22.2.2011

Eric Stigzelius

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## 1. Introduction

Development in information and communications technologies such as smart mobile devices and social media offer new opportunities that can be utilized in education. The annual Horizon Report (Johnson et al. 2009, Johnson et al. 2010) identifies emerging technologies in education. Some technologies listed in the yearly Horizon report are mobile computing, simple augmented reality, electronic books, gesture based computing, visual data analysis, cloud computing, the personal web, semantic-aware applications and smart objects. However, the use of new technologies in education is still lagging behind. Kirbey et al. (2006) predict that in spite of the fact that technology changes very rapidly, almost all of the tools that will be used in teaching and learning in 2020 already exist today.

Implementing emerging technologies in education faces many challenges. Korpelainen, Vartiainen and Kira (2010) explain in their article, "Self-Determined Adoption of an ICT System in a Work Organization", that a successful adoption is fundamental to a productive use of a system. Adoption is the key stone which contributes to a wide use of the technology in an organization. Understanding the user adoption of new technologies, and the ability to use this information in the implementation process, can improve the use of new technologies in education. The adoption of a new technology is not a simple process: it includes many factors which influence the intention to use and different phases the user experiences.

The adoption of new technologies is widely researched. The most used individual adoption theories are Technology Acceptance Model (TAM) (Davis 1989) and the theory constructed from eight adoption theories, The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003). These theories propose factors which influence the intention to use of new technologies. In addition to these two theories, Rogers' (2003) discusses in the book 'Diffusion of Innovation' challenges faced when a user encounters change. The implementation phase of the theory is expanded by West et al. (2006) by explaining the phases a user progresses through when adopting a new system.

The aim of this study is to identify and describe practices, problems, and concepts in the adoption of an online learning environment. The online learning environment is used by teachers in primary, lower secondary, and upper secondary schools across Finland. Teachers

in the metropolitan area of Helsinki were interviewed for this thesis. The aim of the teacher interviews was to gather information about their experiences with the online learning environment, how they started to use it, the usefulness and benefits offered by the online learning environment, what kind of support they got in the implementation process, and challenges related to the use of the online learning environment.

## 1.1 Background

This study is part of a larger research program called Next Media. Next Media is funded by Tekes and coordinated by Tivit Oy. Forty-four companies and eight research organizations are actors of this research program. The aim of the program is to strengthen and ensure Finland's position as a significant global actor in the media industry. Next Media develops future concepts, business models and organizational development practices to enhance the Finnish media industry. Because of its large size, Next Media is divided into smaller divisions, shown in Figure 1. This thesis is a sub-project of the division called Multichannel Multimarket Media Services (MuMuMeSe). The main goals and research questions for MuMuMeSe are the internationalization of multichannel online services and processes, new ecosystems and business models for new services, and new scalable multichannel online concepts.

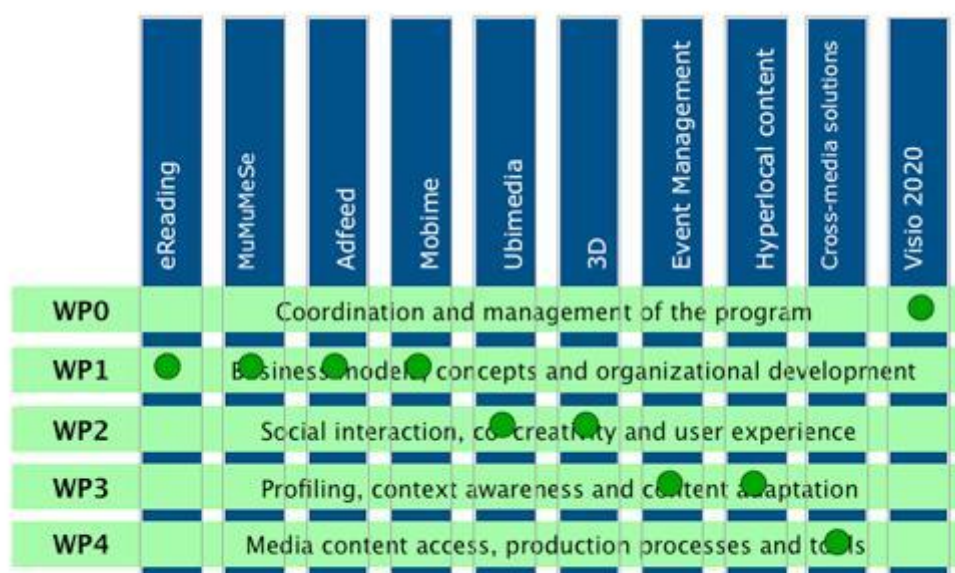


Figure 1. Next Media's different divisions and work packages (Pipatti 2010)



The study has been conducted at BIT Research Centre at Aalto University for a case company. The case company released a beta version of a new online learning environment in August 2010. The new online learning environment is a tool for teachers. The case company also operates other online learning environments and has a wide user base. At the launch of the new online learning environment many users experimented with the new online learning environment. The study for the thesis started in June 2010, which means that the author of this thesis had the opportunity to actually observe and analyze the adoption of the new online learning environment.

## 1.2 Research questions

The main objective of this thesis was to analyze the adoption of a new online learning environment, and the process was studied from a teacher's point of view. Three research questions regarding the adoption are proposed. Individually, each question represents an important part of the adoption process. Together these three research questions give a good overview of how an online learning environment is adopted. The three research questions are:

### **Q1. What are the critical phases in the adoption process?**

The objective of this research question is to investigate the different phases a user experiences when she or he starts using a new online learning environment. If there are any problems, at which phase do they occur?

### **Q2. Which factors influence the intention to use?**

This research question answers what influences the intention to use the new online learning environment. According to the Technology Acceptance Model (TAM) intention to use is the key moderator of user's behavior, more about TAM in Chapter 3.3.1. This research question is important in enabling the identifications of the required changes for an improved adoption, if any are needed.

### **Q3.What are the practices and challenges using an online learning environment?**

How is the new online learning environment used? What kind of challenges do teacher experience when using the new online learning environment? The first two research questions are intended for the adoption of the new online learning environment. This research question is about the usage behavior of the online learning environment.

## **1.3 Scope and limitations**

The scope of this study was the user adoption of the new online learning environment. In this study the teachers are the users. It is researched from a work context view, and the new online learning environment is a tool for the teachers to support his or her daily job. The adoption by students and pupils is also important but is outside of the scope of this research.

## **1.4 Structure of thesis**

This thesis is divided into two parts (Figure 2). The first part is an overview of the available literature and provides the theoretical framework of this study. It begins with defining basic concepts in this area: online learning environments, blended learning, and facilitating conditions in schools in Finland. The theoretical part then continues with an insight into the most relevant adoption theories. The theories described are used in the second part of the thesis, which is the empirical case study.

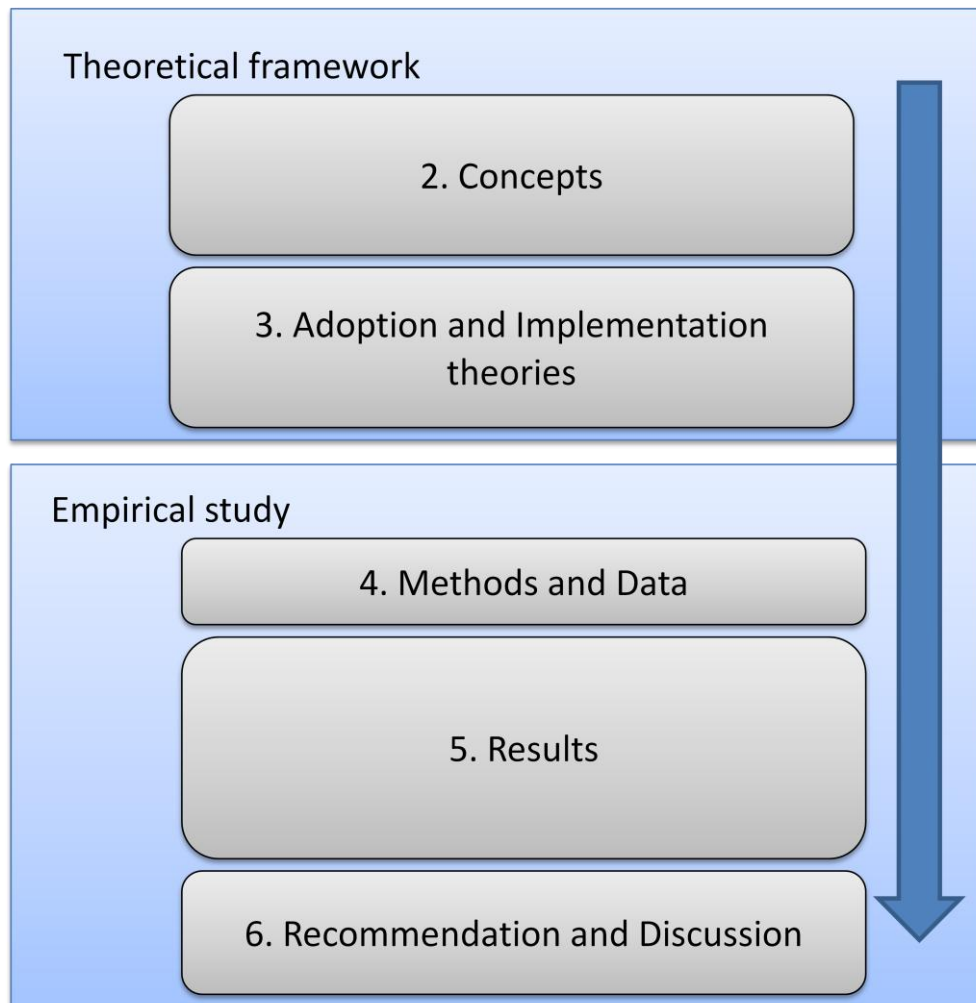


Figure 2. Structure of thesis

The empirical part begins by describing the research method and data collection. It includes a description of the online learning environment and the case company. Details about the interviewed teachers are given in this part, after the description of the methods. The empirical section continues with the results. The results are divided into three sections. The sections are divided according to the research questions: critical phases in the adoption process, factors influencing the intention to use and practices and challenges using an online learning environment. Then in chapter six the results are discussed and suggestions are made. In the last two sections of the last chapter, further future research questions are proposed and an evaluation of this study is done.

## 2 Concepts

In this chapter concepts relevant to this study are described. Topics include online learning environments, blended learning and teacher's facilitating conditions. The first section, 2.1 Emerging Technologies, discusses emerging technologies and online learning environments. It is discussed to give an overview of the situation for emerging technologies and to explain what an online learning environment is.

It is noticed in the research that most of the teachers use both traditional face-to-face methods and digital material in teaching. This combination is called blended learning and is discussed in section 2.2 Blended learning. The last section of this chapter, 2.3 Facilitating conditions, is a discussion about teachers' computer skills. This section will also give an overview of the amount and quality of the computers used in schools, which is the work environment for teachers.

### 2.1 Emerging technologies

Modern technology was used for the first time for educational purpose at the beginning of the Second World War in the United States' military. After the Second World War, educational movies were introduced to universities across the U.S.A and Europe. Educational institutes were interested in the new technology and invested to develop an infrastructure of television cables around campuses. However, the implementation of the television to education was not a success. The first problem was that the universities did not have the knowledge to make instructional programs for television. Second, the teachers did not know how to integrate the television to teaching. Finally, the students thought the instructional programs were boring because the television could not interact with the learner. Television was a one-way instructional feeder that enabled communication and collaboration (Rosenberg 2001). Computer-based learning was the next major technology introduced in education after television. In the seventies and eighties, computer based learning was still relatively insignificant because of the expense. Computers changed at a rapid pace and it was not clear if an investment in one system would be compatible with the next one because of the fast changes. The simplicity of computers at that time negatively affected their use because students could only read text and answer simple questions. Later on when

computers became inexpensive, hardware became more performing and software more user friendly, computer based learning was adopted by organizations and educational institutions. Learning with computers was named E-learning (Peng et al. 2009). Rosenberg (2001, p. 28) defines E-learning as “the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance.” E-learning is a cost effective way to teach because the amount of students is easy to scale. Other benefits of e-learning include the availability of learning material and individual learning. Mobile learning, or m-learning, is a newer form of e-learning with portable devices (Seisto et al. 2010). Internet expanded the options available for learners. Today many new emerging technologies are available for teachers. The learner in an online learning environment can choose between different devices that best suit his or her own individual needs.

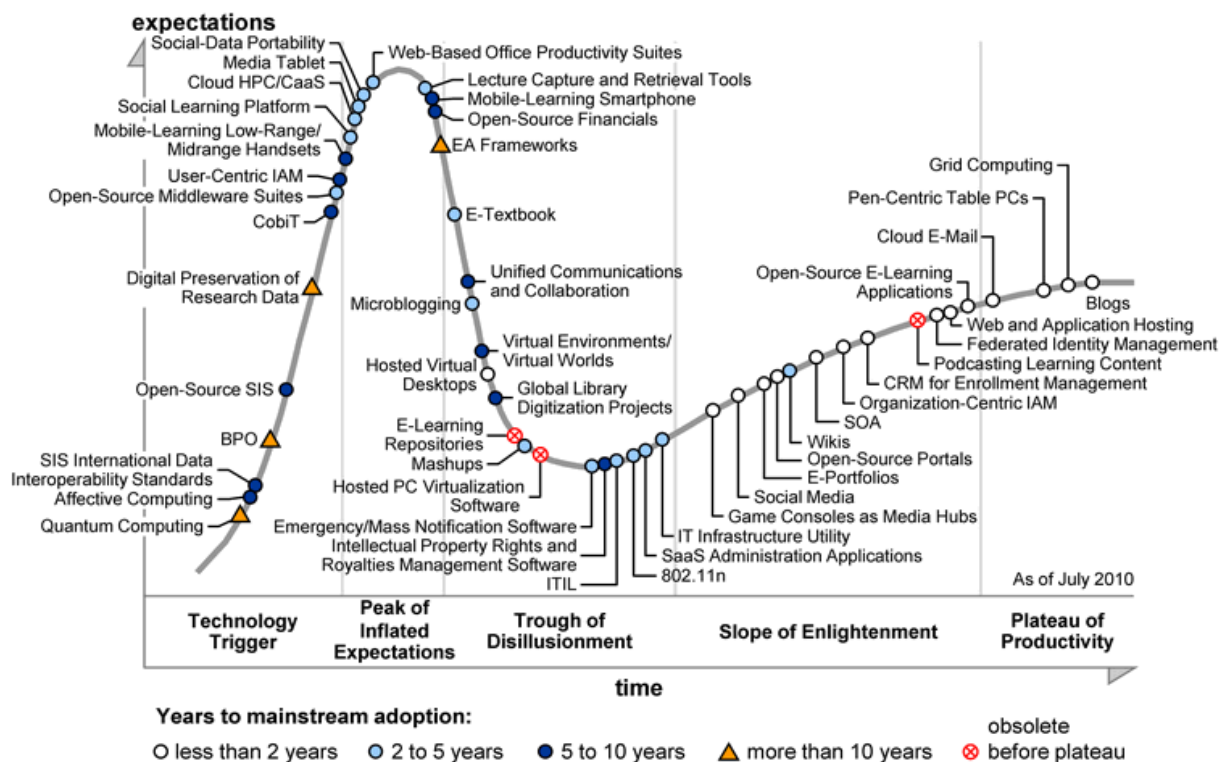


Figure 3. Emerging technologies and trends in K-12 education (Rust 2010, p. 5)

As described in the introduction, the annual Horizon Report (Johnson et al. 2009, Johnson et al. 2010) identifies emerging technologies in education. Gartner is a leading international ICT research and consulting company. Gartner predicts emerging technologies and trends in the near future in education (Rust 2010). Figure 3 displays new trends and emerging technologies becoming mainstreams in education. As can be seen in the figure, new technologies are developing and coming to market with an enormous speed. When technologies continue to evolve with a rapid speed, digital literacy must necessarily be less about tools and more about ways of thinking and seeing. Education systems have to be agile and change rapidly to new demands. Big changes are required to develop new innovative and effective methods that support student learning (Hodge and Collins 2010, OECD 2006).

Online learning environments could be either a supplementary learning tool for a traditional class or the main platform in distance learning (Pituch and Lee 2004). In this study the online learning environment is a supplementary learning tool for a traditional class. An online learning platform is a web-based platform which allows teachers and students to access it from anywhere with a reliable connection. In comparison to a normal online platform, an online learning environment contains digital material especially designed for learning. Content and applications which can be found in an online learning environment are program information, course content, teacher material, discussion boards, document sharing systems and learning resources (Raaij and Schepers 2006).

## **2.2 Blended learning**

Blended learning is a mixture of online learning and traditional face-to-face learning. Chen (2009, p. 300) describes blended learning as “a learning environment that either combines teaching methods, delivery methods, media formats or a mixture of all these”. Researchers have different opinions as what can be considered blended learning. According to Hastie et al. (2010) blended learning consists of four basic elements: teacher, student, physical classroom, and cyber classroom. Blended learning is a combination of at least two of the basic four elements. This theory includes a couple of limitations. It is not a blended learning environment when only students and teachers are mixed or when students, teachers, and

classrooms are mixed. Hastie et al. do not mention different learning methods or instructions, only the physical beings and spaces. Other researchers define blended learning with the methods for teaching. According to Graham (2004) there are three components in blended learning that can be mixed: combining instructional modalities, combining instructional methods, and combining online teaching with face-to-face instructions.

Previous research about learning technologies tends to focus on comparing learning that takes place either in a traditional face-to-face environment, or exclusively online. E-learning tends to have limited social interaction and to be less spontaneous than face-to-face classes (Gribbins et al. 2007). Blended learning combines these two extremes, face-to-face learning and e-learning. What we term “blended learning” is much more common in organizations and schools than either of these extremes. Blended learning is considered a key teaching method in education, business, government and military.

Many strengths are recognized with the combination of e-learning and traditional face-to-face learning, blended learning. For example, improved pedagogy, increased access/flexibility, and increased cost effectiveness are advantages with blended learning (Osguthorpe and Graham 2003). Improved pedagogy is one advantage of blended learning. When learning in different media; visual, audible, and textual, the information will be processed in different parts of the cortex. This will facilitate learning and transfer the information to a long term memory (Mayer and Moreno 1998). Traditional learning tends to focus more on verbal and textual presentations. An online learning environment offers visual stimulation for the learner through visual presentations, animations, and pictures. By combining an online learning environment with face-to-face teaching, blended learning offers all of these learning modes; visual, audible and textual. As explained in the previous section, many new emerging technologies, including portable devices, are or will soon be available for teachers.

In blended learning, teaching methods can be customized for individual needs, especially with the help of online learning environments (Naismith et al. 2004, Anderson 2004b). Kilpiö (2008) wrote in her dissertation about teachers’ technology acceptance. Kilpiö interviewed thirty-two teachers and five principals about their use of technology. In the research, teachers thought that using computers personalized teaching. Personalizing the education

was very helpful and facilitated learning. Those students who were faster, could do more advanced tasks and at their own pace. Those students who needed more time could do easier tasks and also at their own pace. Teaching can happen both synchronously and asynchronously in blended learning. Mobile devices are portable and enable learners to connect to the Internet anywhere and anytime (Johnson et al. 2010, Seisto et al. 2010). This means that learners can choose when to learn according to their own needs and wants, which in turn increases the flexibility of learning (Osguthorpe and Graham 2003). An ideal innovation should fit in with the user's daily work and disturb the business process as little as possible (DeFillippi and Wankel 2003).

In blended learning the focus is moving from the instructor to the learner. Wong et al. (2008) describe the learner as a knowledge generator and an active participant and the teacher as the facilitator. Anderson argues that the focus should be on learning and not on the learner alone. The process of getting and using information should be emphasized. Anderson calls it "learning centered" instead of "learner centered" (Anderson 2004b). It is the beginning of the end of the hierarchical way of learning (Aceto et al. 2007).

Even though the focus moves from the teacher to the learner, the teacher still has a very important role and is the key to successful learning (OECD 2006). Teachers have an advising and facilitating role in blended learning (Ally 2004). Anderson has created a theoretical model for blended learning called the Community of Inquiry, shown in Figure 4. The model has three components: cognitive presence, social presence and teaching presence. Cognitive presence supports the development of critical thinking. Social presence is the surrounding community and the culture. With a social presence present, students feel safe to share their ideas and be open to new thoughts. Students can easily share their disagreements and viewpoints without feeling anxious or being degraded. The teacher presence means that there is someone organizing, facilitating and instructing the learning. With all of the components present, learning will become more effective (Anderson 2004a).



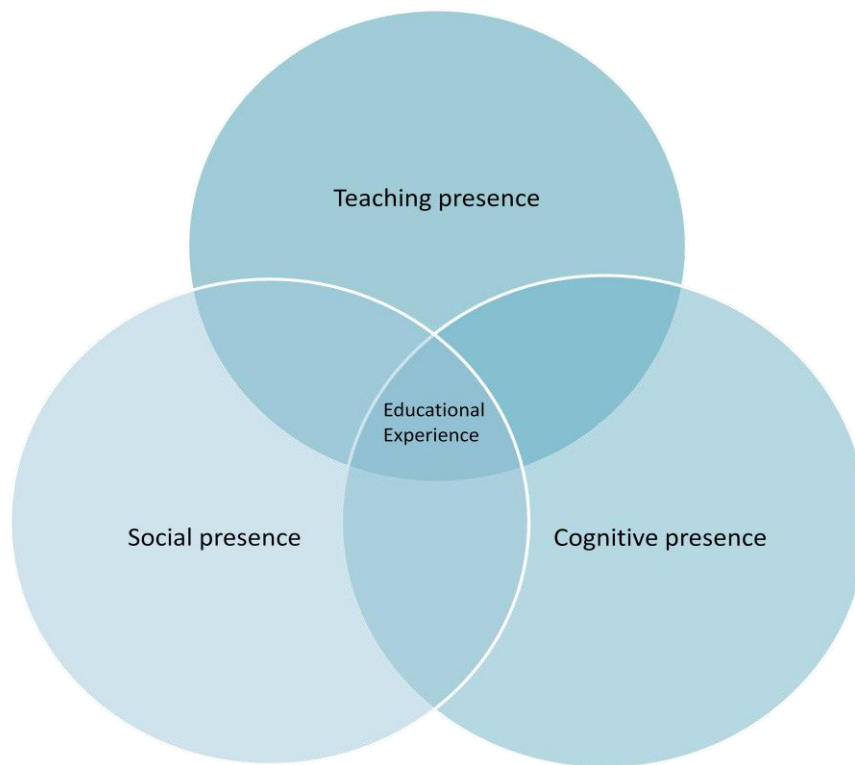


Figure 4. Community of Inquiry (Anderson 2004a, p. 275)

### 2.3 Teachers' computer and Internet usage

Eighty-five percent of all teachers in Finland had used a computer in the classroom during the last twelve months according to a survey made by the Empirica (Korte and Hüsing 2006). In the same survey they listed teachers' access, competence, and motivation to use the Internet in class (Table 1). Approximately eighty-five percent of teachers felt that they have enough competence to use Internet in education. Only about sixty-three percent felt that they have access to computers and Internet and almost fifty-eight percent of the teachers had the motivation to use computers in their classrooms.

Table 1. Teachers competence and motivation to use Internet (Korte and Hüsing 2006, p. 33)

|      | Access % | Competence % | Motivation % |
|------|----------|--------------|--------------|
| 2006 | 63,33    | 84,9         | 57,8         |

The use of the Internet is increasing in Finland. In 2009, seventy-nine percent of the Finnish population used the Internet at least once per week (European Commission 2010, p. 153) (Table 2). The expanded use of Internet increases computer knowledge among possible users. In Kilpiö's (2008) dissertation about teachers' technology acceptance, she explains that earlier experience of using computers and Internet is an advantage when trying to adopt a new system. It is also easier to adopt a continuous innovation (Moore 1999). A continuous innovation is a new tool or service that does not change the user's behavior. If the new innovation changes the behavior of the user, it is a discontinuous innovation.

Table 2. Internet usage in Finland 2006-2009 (European Commission 2010, p. 153)

| Internet usage | uses Internet<br>once a week % | uses Internet<br>everyday % | never used<br>Internet % | households with<br>Internet<br>connection % |
|----------------|--------------------------------|-----------------------------|--------------------------|---|
| 2009           | 79                             | 68                          | 15                       | 78  |
| 2008           | 78                             | 66                          | 13                       | 72  |
| 2007           | 75                             | 62                          | 17                       | 69  |
| 2006           | 71                             | 56                          | 18                       | 65  |

All primary schools in Finland had Internet access in 2006 (Korte and Hüsing 2006). In 2000 there were eleven students per one computer in primary and lower secondary schools (Table 3). This number varies depending on the location of the school and on the size of the school. Smaller schools, with less than one hundred students had only four students sharing one computer. In larger schools, there were fewer computers per a student (Ministry of Education and Culture 2005). The amounts of computers have increased since 2000 and in 2009 there were six students per one computer in primary and lower secondary schools. At the same time the amount of old computers have decreased. The numbers in Table 3 are gathered by Statistics Finland. No data was gathered by Statistics Finland in 2007.

Table 3. Amount of computers in schools (Ministry of Education and Culture 2001, 2003, 2005, Eİİ 2010)

|      | students/computer     | old computers % | computers with Internet connection % |
|------|-----------------------|-----------------|--------------------------------------|
| 2009 | 6                     | 61              |                                      |
| 2008 | 6                     | 61              |                                      |
| 2007 | no statistic for 2007 |                 |                                      |
| 2006 | 7                     | 62              |                                      |
| 2005 | 8                     | 62              |                                      |
| 2004 | 8                     | 64              | 90                                   |
| 2003 | 9                     | 64              |                                      |
| 2002 | 9                     | 67              | 83,7                                 |
| 2001 | 10                    | 66              |                                      |
| 2000 | 11                    | 63              | 73                                   |

In addition to computers, many teachers have access to interactive whiteboards, document cameras, and projectors. On the whiteboard a user can basically do all the same things that an user can do on a computer. The computer's mouse indicator can be moved by touching the interactive whiteboard with your hands as a tool. Teachers can present still pictures, animations, videos and sound on a whiteboard. Online learning environments with digital material can be showed on the interactive whiteboard. BECTA (Somekh et al. 2007) evaluated the use of whiteboards in primary schools and found evidence that students in schools using interactive whiteboards for at least two years scored better on national tests.

### 3. Implementation and adoption

In this chapter, relevant methods and theories found in the literature are discussed. In the first part of this chapter, adoption and implementation are explained and discussed generally. In section 3.2 the technology adoption life cycle is explained. In the following section 3.3 the most important individual adoption models are discussed. In the last part, section 3.4 the different phases a user experiences when adopting a new technology are described

#### 3.1 Introduction

Implementing and adopting new technologies in education raises questions and new demands among teachers. Learning to use an online learning environment is only the first step. In addition to learning how to use the online learning environment, teachers need to be knowledgeable of how to use it effectively in the classroom; they need new pedagogical practices. A part of the new pedagogical practices are planning the lecture and instructing and enabling the student to use the technology (Ertmer and Ottenbreit-Leftwich 2010). The

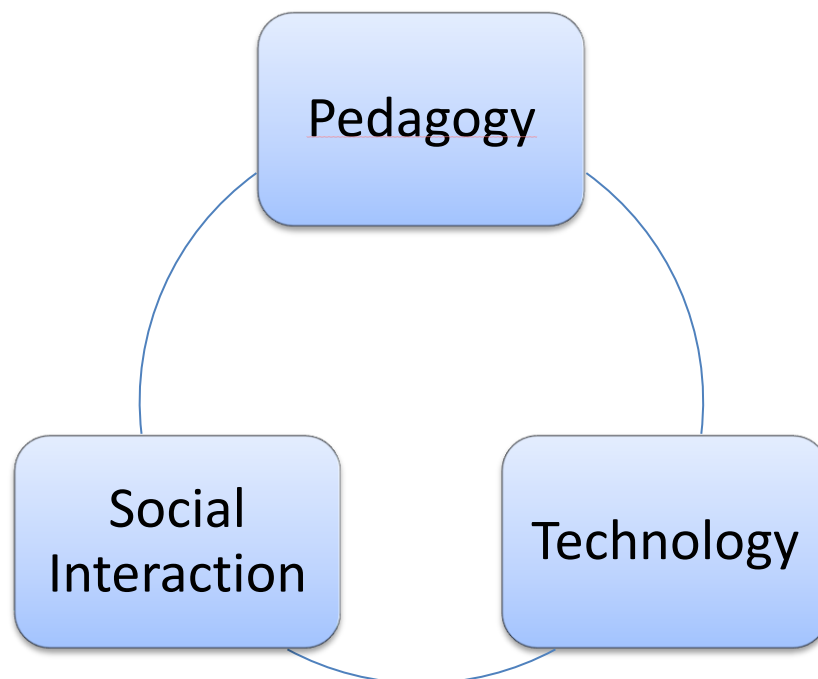


Figure 5. Skills teachers need when adopting a new technology (Wang 2008, p. 412)

instructor needs support in developing the skills to master the new innovations and pedagogical skills needed (Hague and Williamson 2009). Wang (2008) describes a general model that contains the elemental components needed for a teacher when implementing a new innovation (Figure 5). In addition to the issues discussed earlier, that are technology and pedagogy, social interaction is also among the key components that influence the use of an online learning environment. Hague and Williamson (2009) point out that current training offered for teachers concentrates on how to master the software or the hardware. Instead more time should be used to teach new practices and pedagogy skills.

Even though the principal and other managers in the organization make the decisions about new technologies, users are the ones that determine how the technology is used or if it is going to be used at all. In schools it is the teacher who makes the final decision of whether to use the technology or not (Kilpiö 2008). For the instructor to adopt an online learning environment, the user has to be fully confident with the new technology and familiar with available support (McFarlane et al. 2008). Adoption and implementation of a new innovation requires effort from both the individual and the organization. Using different tools and devices in learning does not automatically become a success story. It is not sufficient just to give an instructor or employees in an organization a new innovation and tell them to teach. The process of implementing new tools can be seen as an implementation bridge. The current practices are on one side of a large gap and on the other side are new routines with new tools. To get to the new routines, the instructor must have enough support, otherwise the bridge will collapse. Crossing the bridge does not happen in one night: the time period for instructors to start using new tools can take up to three years (Hall 2010).

Kwon and Zmud developed an IT implementation process for organizations in 1987 (Cooper and Zmud 1990). Gallivan (2001) describes Zmud and colleagues' implementation process to be the best-known model in technology implementation. Other well known and used organization level process models of implementation are: Roger's five-stage model of innovation (Rogers 2003) and The Delone and McLeans model of information systems success (DeLone and McLean 2003). The implementation process consists of six steps: Initiation, Adoption, Adaptation, Acceptance, Routinization, and Infusion (Figure 6). Many of these steps are outside the scope of this thesis, but this model is briefly explained to give a more complete picture of the whole implementation process for an organization. Rogers

(2003) explains that adoption by an organization is more complicated than adoption by a single user.

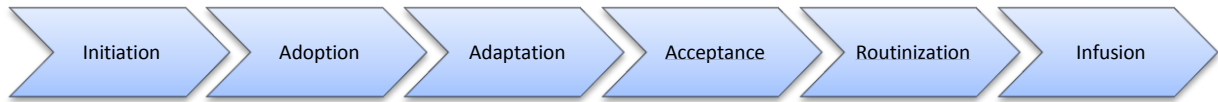


Figure 6. Zmud and Colleagues' implementation process (Cooper and Zmud 1990, pp. 124-125)

Initiation and Adoption are decisions the management has to make before implementing a new technology. In the Adaptation step, the online learning environment is installed and users are trained, both in the new program and in new ways of teaching.

There are two ways of learning how to use a new ICT tool, either by informal learning or by formal learning. Formal learning is what is usually referred to as training. Informal learning is what is learned when the online learning environment is in use, also called on-the-job learning (Korpelainen and Kira 2010). Training has a higher impact on the success of implementing an online learning environment when the user interface is poorly designed and has high technical complexity. On the other hand, training does not affect the success of implementation when the system is of low complexity. In this case the teacher faces limited knowledge barriers and can overcome these with self-learning and instructions (Sharma and Yetton 2007, Inan and Lowther 2010).

In the next phase of the implementation process, Acceptance, the instructor uses the online environment for the first time in a work context. In this phase the instructor increases her skills and knowledge about the online learning environment with informal learning. In Routinization, the instructor has become extensively familiarized with the innovation, and it has already been integrated into the education. During the Infusion phase, the new “wow effect” that the technology possesses as a novelty disappears as it becomes part of the daily routine. By this time, the use of the new software has made education more effective.

### 3.2 Technology adoption life cycle

According to the technology adoption life cycle (Moore 1999, Rogers 2003) people adopt technology differently (Figure 7). Some individuals adopt new technologies more naturally than others (Leonard-Barton and Deschamps 1988). Five different personalities are described in the technology adoption cycle: Innovators, Early Adopters, Early Majority, Late Majority, and Laggards.

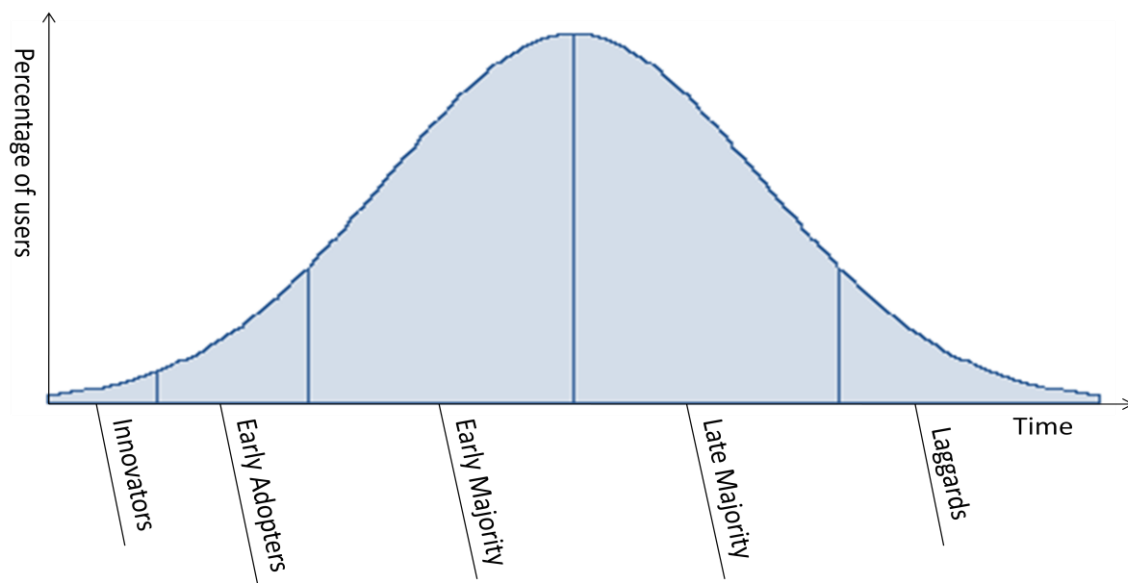


Figure 7. Technology Adoption Life Cycle (Moore 1999, p. 12)

Innovators are the ones who seek for new opportunities and are ready to try anything. According to Moore (1999), Innovators are usually technologists, which mean that technology is usually in the center of their interest. Early Adopters', adopts technology very early, are open minded to new technologies, and try to find benefits with the technology. Those in the Early Majority are interested in technology, but they wait and see how the technology works before adopting it. The Late Majority waits for a technology to become a standard before they try to adopt it. Laggards are those who are not interested in new technology. They are conservative and do not want anything to change. Most people belong to Early Majority and Late Majority.

Teachers as a group cannot be categorized as only one of these types. Instead one has to assume that all of the mentioned groups can be identified among teachers. Some are willing to adopt a technology and some do not want anything to do with new technology. In an organizational context, work motivation can be a key factor which influences the extent of which an individual will adopt a new innovation. Leonard-Barton and Deschamps (1988) describe that individuals who are high performers, or perceive themselves to be high performers, are more likely to adopt a new innovation which improves their work results. People can have different characteristics in different contexts. High performers could be more to the left in the technology adoption cycle in a work context and more to the right in their free time.

### 3.3 Individual adoption models

In this section relevant models and frameworks for implementing and adopting online learning environments in organizations are reviewed from a user's point of view. Many of the theories are not directly meant for implementing learning environments. Some of the theories are developed and used for entirely different purposes but are still accurate when adopting an online learning environment. A teacher's beliefs and readiness is a crucial factor when implementing new technologies to learning. Traditional adoption models investigate the implementation from the user's point of view. Organization level process models describe the whole process from a wider perspective.

Most of the complex problems in the implementation process are related to human factors. This is one of the reasons why individual technology adoption models play an important role and are widely researched. There are many theories and models that describe the individual technology adoption. The most cited and used traditional adaption models when implementing new technologies in an organization are: Diffusion of innovations, The Theory of Reasoned Action, the Technology Acceptance Model (TAM), the Theory of Planned Behavior, Social-Cognitive Theory, and the Unified Theory of Acceptance and Use of Technology (UTAUT). The most influential model has been TAM and its extended version TAM 2 (Gallivan 2001). There is no commonly accepted adoption model, all of the models mentioned above, are used. Researchers choose a model and modify it, which has led to a



number of variations of each model and research being farther away from a commonly accepted model (Benbasat and Barki 2007). TAM2 and UTAUT are used in the empirical part of this study and are therefore described in the following sections.

### 3.3.1 TAM

One of the most used and cited implementing theories is the Technology Acceptance Model (TAM), shown in Figure 8 (Davis 1989, Davis et al. 1989). This model was developed by Davis from Ajzen and Fishbein's Theory of Reasoned Action (TRA), which explains an individual's actions when adopting a new technology. TAM describes how and what factors contribute to the individual's behavioral attitude changes when implementing new technologies. Venkatesh et al. (2003, p. 428) explain that "TAM was designed to predict information technology acceptance and usage on the job." In the Technology Acceptance Model, the fundamental factors that influence teachers' attitudes towards using computers and intended use are Perceived Usefulness and Perceived Ease of Use. Perceived Usefulness is how a user feels that the innovation contributes to make the work more effective and improves the results.

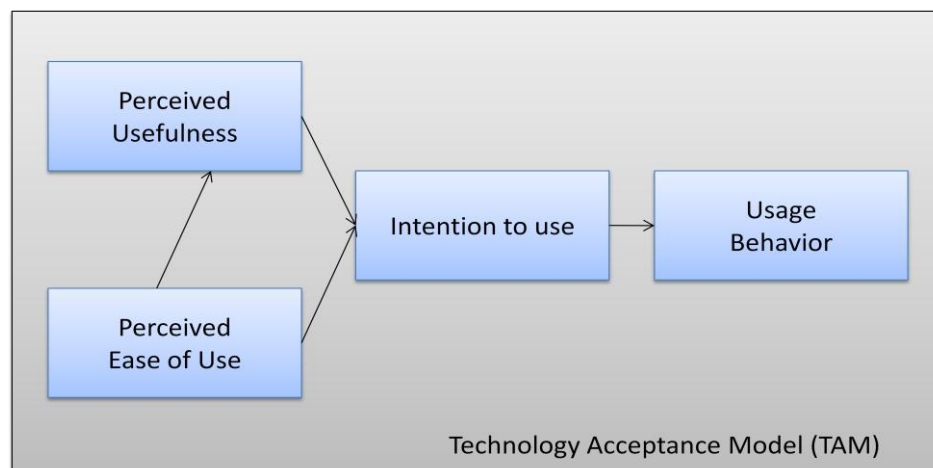


Figure 8. Technology Acceptance Model (TAM) (Venkatesh and Davis 2000, p. 188)

Perceived Ease of Use measures the effort the user has to exert to use the system. They are both influenced by external variables. Venkatesh and Davis (2000) extended the model with

explanations on what contributes to Perceived Usefulness and Perceived Ease of Use. The new model is called TAM 2 (Venkatesh and Davis 2000, Chuttur 2009).

### 3.3.2 TAM 2

TAM 2 is the extended version of the technology acceptance model, proposed by Venkatesh and Davis (2000). The model is extended with factors that affect both Perceived Usefulness and Perceived Ease of Use. TAM 2 is used in this study to construct the framework for the interviews.

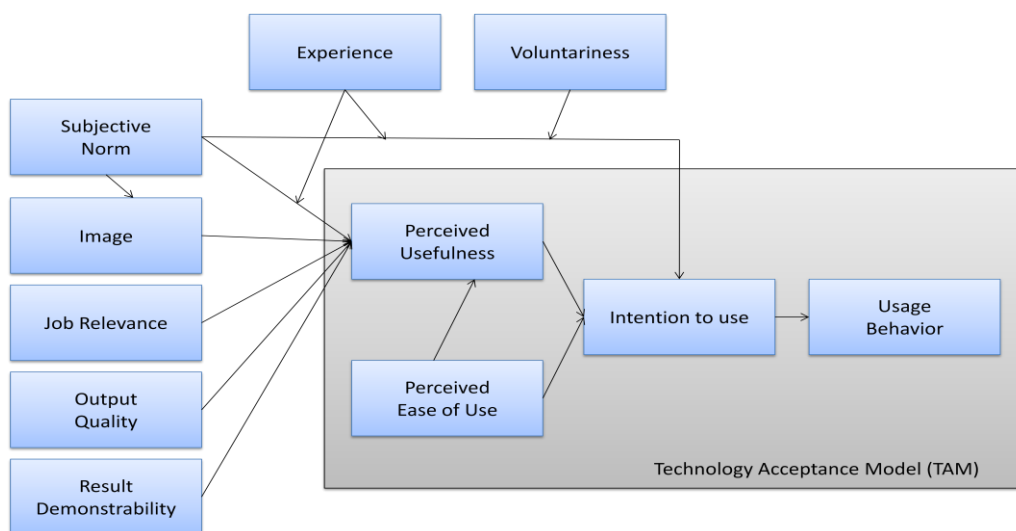


Figure 9. TAM 2 - Factors influencing Perceived Usefulness (Venkatesh and Davis 2000, p. 188)

According to TAM 2 there are five direct factors that influence the Perceived Usefulness (Figure 9): Subjective Norm, Image, Job Relevance, Output Quality, and Result Demonstrability. There are also two indirect factors that contribute to the effect of Subjective Norm on Perceived Usefulness, Experience, and Voluntariness of a user.

Subjective Norm and Image measure if the technology is socially accepted or not. It is how the user thinks that others will perceive him or her if the new system is used. Even if a teacher does not want to use the new online learning environment, he or she may choose to use the new innovation because of what other trusted individuals think about the product.

Subjective Norm concerns opinions from people the teacher respects that affect the Perceived Usefulness. People with charisma and good leadership qualities have greater impact on the acceptance of the technology. It does not have to be the manager, or in this case the principal, who has the biggest influence on the user, it could also be co-workers, friends, and family. It is people who are important that have the most influence. Image is how the user perceives others think about the technology. Based on this assumption, the user creates an opinion about how acceptable it is. Image also reflects the user's social position. Voluntariness is connected to a subjective norm in the model. Venkatesh and Davis (2000) found out that the Subjective Norm did not affect Intention to Use if the product was voluntarily used but it had an effect when use was mandatory. In this model, Voluntariness means how the user perceives the use of technology to be mandatory or not. Even though the technology might be obligatory, the user may perceive that he or she is using the technology voluntarily. This could also happen the other way around. With experience the effect of Subjective Norm becomes insignificant. Without experience, the user is more reliant on other people's opinions about the technology. As users gain experience, they trust their own opinion: the opinions of others are no longer significantly important. Venkatesh and Davis made the conclusion that the effect of Subjective Norm vanishes with time as the user gathers experience.

The third factor is Job Relevance affecting Perceived Usefulness. The users own perception of the Job Relevance effects how useful the technology is perceived to be. It explains how well technology supports job tasks and how it will help the user to achieve goals. Output Quality, indicates how well the technologies perform the regular work tasks. The last factor is Result Demonstrability. It is important to be able to measure and demonstrate the results so that the user understands how useful a technology is. Without any existing demonstrable positive results from the technology, the user might have doubts about the usefulness of the technology and how the technology can be used. Venkatesh and Davis (2000) state that implementing an effective system can lead to failure if the Perceived Usefulness cannot be demonstrated.

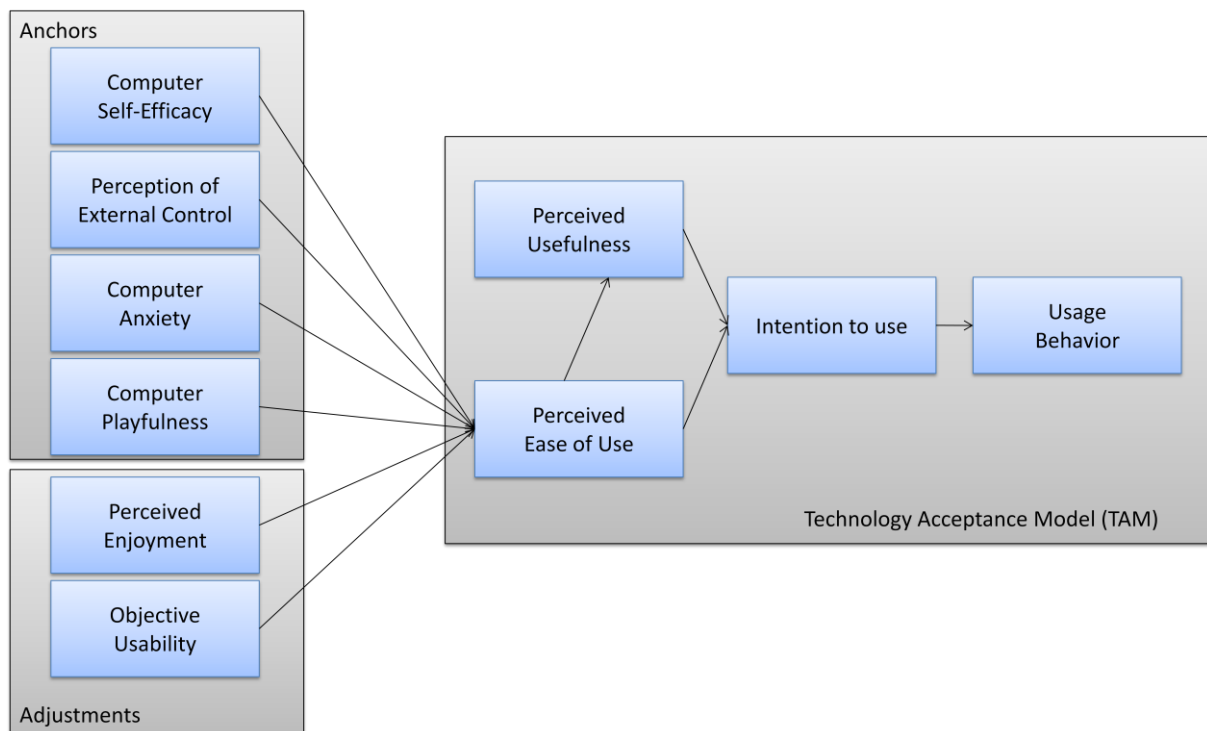


Figure 10. TAM 2 - Factors influencing Perceived Ease of Use (Venkatesh 2000, p. 346)

Venkatesh (2000) divides the factors affecting the Perceived Ease of Use into two categories, Anchors and Adjustment (Figure 10). Anchors are the user's general thoughts about a technology, the usage of a technology, and could be applied to any new innovation. Adjustments are the individuals specific thoughts about the specific technology being investigated which are shaped by experience using the system. The Anchors are: Computer Self-Efficacy, Perceptions of External Control, Computer Anxiety, and Computer Playfulness. Adjustments are Perceived Enjoyment and Objective Usability.

Venkatesh (2000) has divided control of computers in internal and external control. Computer Self-Efficacy, which is the first Anchor, is the internal control that the teacher perceives. It is the teacher's perceived ability to use computers and other technological components at work; in other words, it is not about how skilled the teacher actually is with computers but rather how skilled the teacher personally thinks, him or herself to be with computers. Perception of External Control, the second Anchor, is how the teachers perceive the availability of knowledge, support, and resources. Computer Anxiety is the emotion that the teacher experiences when using computers. Computer anxiety has a negative or neutral influence on Perceived Ease of Use. If a teacher has a fear of using computers, it will

negatively affect the Perceived Ease of Use. If a teacher is not afraid of using computers, Computer Anxiety does not influence Perceived Ease of Use. Computer Playfulness, the fourth Anchor, is the degree of openness, curiosity, and spontaneity a teacher possesses when using computers. The playfulness does not necessarily mean fun, but rather exploration and discovery of new applications. Venkatesh (2000) states that playful individuals are more willing to spend more time learning a new technology.

### 3.3.3 UTAUT

Venkatesh et al. (2003) proposed The Unified Theory of Acceptance and Use of Technology (UTAUT) (Figure 11). The model has compared and combined eight previous adoption theories through empirical studies; the Theory of Reasoned Action, Technology Acceptance Model, Motivational Model, Theory of Planned Behavior, Combined TAM and TPB, Model of PC Utilization, Innovation Diffusion Theory, and Social Cognitive Theory. UTAUT is used in this study in the analysis of the gathered data. The results in chapter 5 are organized according to the factors affecting both Behavioral Intention and Use Behaviour.

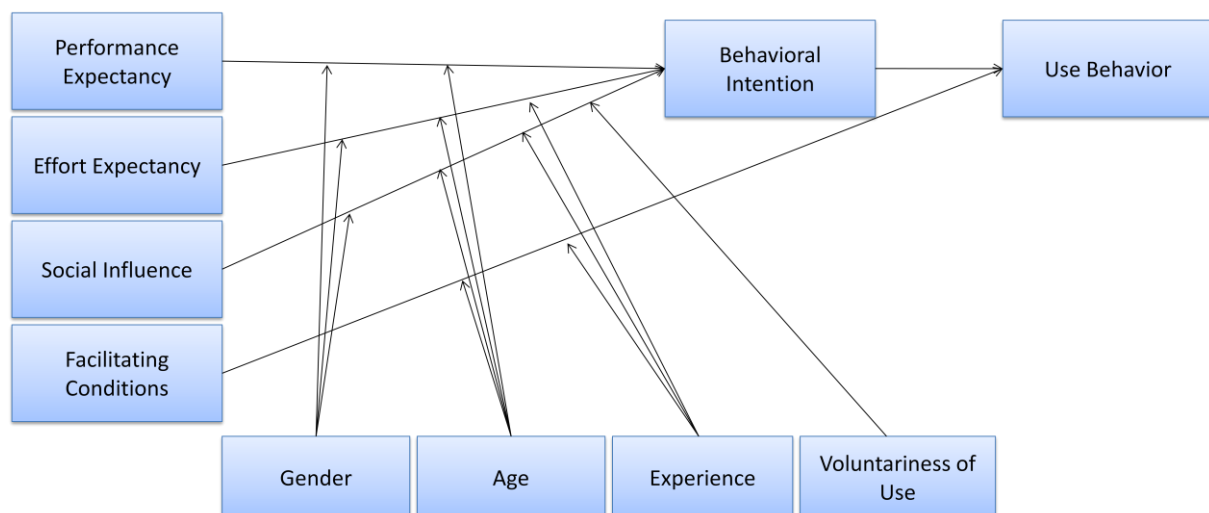


Figure 11. The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003, p. 447)

According to UTAUT, there are three forces which influence Behavioral Intention; Performance Expectancy, Effort Expectancy, and Social Influence. Two determinants affect

actual use: Behavioral Intention and Facilitating Conditions. The model also has four moderators that have an effect on how strong the determinants will be perceived. The four key moderators are Gender, Age, Experience, and Voluntariness of Use.

Venkatesh et al. (2003) define Performance Expectancy as how the user perceives the system to improve job performance and argues that this is the most influential force on behavioral intention. Both gender and age affect Performance Expectancy. Men are more task-oriented and more motivated by a system which enhances the efficiency of work. The effect of Performance Expectancy fades for older users.

Effort Expectancy is how much time and effort users think will be spent using the system. This can be compared to the TAM models Perceived Ease of Use. As in the TAM model, experience and the user's own skills have a substantial impact on the perceived Effort Expectancy. The effect of Effort Expectancy increases with higher age and for women.

Social Influence is what the user considers others to think of a system. When a system is used voluntarily, the effect of Social Influence on Behavioral Intention is minimal. With more experience the user is more independent, and Social Influence is not as strong. Over time, when the user becomes more used to the system, the effect of Social Influence diminishes. Social Influence is important in the beginning of adoption when the newly implemented system is mandatory. The effect increases with women and older workers. This idea is arguable but according to Venkatesh et al. (2003), women are more sensitive to the opinions of others.

Performance Expectancy, Effort Expectancy and Social Influence affect the Behavioral intention to use. Facilitating Conditions and Behavioral Intention have together a great impact on actual use. Facilitating Conditions is the environment where the system is used. It includes equipment used to maneuver the system and available support.

### 3.4 Phases of adoption

Rogers' (2003) model of Diffusion of Innovations has been used in many different circumstances ranging from agricultural tools to innovations in organizations (Venkatesh et al. 2003). It has been adapted to better suit individual adoption of technologies by Moore and Benbasat (1991). The original theory consisted of five attributes that influence the adoption of a new innovation: Relative Advantage, Compatibility, Complexity, Observability, and Trialability (Rogers 2003). The modified theory for adopting information technologies (Moore and Benbasat 1991) includes seven attributes that influence the adoption of an innovation: Compatibility, Relative Advantages, Ease of Use, Result Demonstrability, Image, Visibility, Trialability, and Voluntariness. Rogers (2003) also describes five phases that an instructor goes through when adopting a new technology. Rogers calls this the innovation-decision process:

- 1. Knowledge**
- 2. Persuasion**
- 3. Decision**
- 4. Implementation**
- 5. Confirmation**

The process starts when the individual gets information about the innovation. Rogers describes this with the word Knowledge. The second phase of the process, Persuasion, occurs when an individual forms an attitude, positive or negative, towards the innovation. Already in this stage the technology becomes favorable or unfavorable for the user. In the third step, the individual decides if he or she wants to use the innovation or not. The fourth phase is Implementation, and in this phase the innovation is put into practice. In the last phase, Confirmation, the individual strengthens his or her decision to adopt the product, reduce the use of the product, or discontinue use of the product (West et al. 2006).

West et al. (2006) identified patterns in the fourth phase, Implementation, of Rogers' Diffusion of Innovations model when implementing it to education. The five proposed phases of implementation are as follows:

1. **Experimentation**
2. **Technical Challenges**
3. **Integration Challenges**
4. **Increased Comfort Level**
5. **Adaptation.**

The first phase of Implementation is Experimentation. When adopting the innovation the user starts to experiment with the technology. The Experimentation is usually self learning. The user tries to find out what the different applications do. Both Rogers (2003) and West et al. (2006) found out that a user does not start using all features of a system in the beginning of adoption. This is called trialability as users test the system with a couple of features. After the early experimentation, the individual will face some Technical Challenges. The Technical Challenges include usage of time and how effective the innovation is. After overcoming the Technical Challenges, the individual will face Integration Challenges. Most individuals know how to use new devices or learn to use them fast, but they don't know how to integrate them in to a work context. The fourth phase is naturally Increased Comfort Level after the challenges have been overcome. In the last phase, with an Increased Comfort Level, the instructor can adjust the innovation and a re-invention of some features occurs. The phases in the implementation process do not have to happen in a linear order, they can also overlap each other.

After the implementation process, the user makes a decision of whether to continue using the new technology. The decision is based on how well the implementation process proceeds and how the person adopts the new technology, in this case the online learning environment. West et al. (2006) found three different outcomes that the user decides to do after the implementation process: continuation, reduction, or discontinuation. The continuation decision means that the user finds the technology useful and starts using it in work. Reduction implies that the user chooses to use the technology but only when



necessary. The user does not feel committed to the technology and can try new ones. The third option, discontinuation, is that the user does not start using the product.

West et al. adapted version of Rogers' innovations process is used in the analysis of this thesis. The whole process from Knowledge to Confirmation is illustrated below:

- 1. Knowledge**
- 2. Persuasion**
- 3. Decision**
- 4. Implementation**
  - a. Experimentation**
  - b. Technical Challenges**
  - c. Integration Challenges**
  - d. Increased Comfort Level**
  - e. Adaptation**
- 5. Confirmation**

## **4. Research methods and data collection**

This chapter discusses the methods and data used in this study. The adoption of a new online learning environment is researched. The new online learning environment is provided by the case company. The first two sections of this chapter contain a description about the case company and the new online learning environment. Four different data sources have been used to answer the research questions. The research questions are: What are the critical phases in the adoption process? Which factors influences the intention to use? What are the practices and challenges using an online learning environment? In the third section, the subjects of the interviews, the teachers, are discussed. In the last section, the four different data sources and how they are analyzed is explained.

### **4.1 Case introduction**

The case company for this thesis is one of Finland's largest publishers of printed and digital learning material for use in primary, lower secondary, and upper secondary schools. The case company has introduced a beta version of a new online learning environment for teachers. The implementation and adoption of this new online learning environment was studied in this thesis. Prior to this new online learning environment, the case company had three different platforms offering different kinds of services on the web for teachers and students in schools.

Only one of the old services still exists, and is called the old learning environment in this thesis. The new online learning environment has been developed by combining the other two services. At the moment they have two online learning environments working simultaneously. The old services, which no longer exist, were served in a homepage of the company and as an online learning platform with learning material. The case company's homepage worked as a marketing and information channel for users.

The old online learning environment offers digital content and tools for teaching and learning. The old online learning environment is the only one of these three services that still exists and is used in many schools across Finland. It has a wider option of features than the new online learning environment for example: users can create blogs and collaborate on

projects. It is also used as a communication channel between teachers and students in addition to a news channel for the school.

In addition to the online learning environments, the case company offers support for both teachers and students. The helpdesk is in charge of helping users in problems of both the new and the old online learning environment. In addition to the helpdesk, teachers can call the marketing department to get help. It is usually the marketing department who sells the digital material to teachers. The marketing department also contacts schools to offer their help if it is needed. The case company also hosts marketing events when a new book is published. These events are hosted for teachers interested in using their books. During a marketing event, a presenter demonstrates and tells how the book can be used. In this same event the new online learning environment is also briefly displayed.

## **4.2 The new online learning environment**

The new online learning environment is still a beta version being tested. The case company has conducted, and is conducting, their own usability tests, mostly concerning the user interface but also regarding the ease of use. The new online learning environment, even though it is still a beta version, was published in August 2010. It is the adoption of this new online learning environment that is investigated in this study.

The new online learning environment combines the features from the old homepage and the old database. The user interface is new in the new online learning environments. Users going to the case company's old database are redirected to the new online learning environment. It consists of a work space for teachers and a web shop where digital material can be purchased. Teachers can access digital learning material in the workspace. This research only includes the adoption and use of the workspace.

The new online learning environment is on the web, so it can be reached from anywhere with any web-enabled device as long as there is a viable connection. The new online learning environment consists of three modules. Each module has its independent purpose. The three modules are displayed in boxes side by side. The first one, the folder, is a list with all the digital material that the teacher can use and has the right to access. The digital learning

material in the online learning environment is connected to a printed series of books. The digital material is sorted alphabetically by the book's title. The second box, the drag and drop box, is a module that can be used to bookmark the most used items for faster access. Items from the folder can be dragged to the drag and drop box. The module then creates a link to the item, which makes it easily available for the teacher. The third module, the student key box, is a list with codes which can be used by students to access exercises. Teachers are the only ones who have to sign in to the new online learning environment. Students can however do exercises with a code given by the teacher, which are listed in the key box. The landing page of the new online learning environment has a small box, with a picture of a key on it. When inserting a code into the box, the student will access a list with exercises.

### 4.3 The subjects – the teachers

Eleven teachers were interviewed about the adoption and use of the new online learning environment. Four of the teachers were from primary schools, five of the teachers were from lower secondary schools, and two were teaching in upper secondary (Figure 12). All of the interviewed teachers were women. Eight teachers worked in schools in Helsinki, two teachers in Espoo, and one in Vantaa.

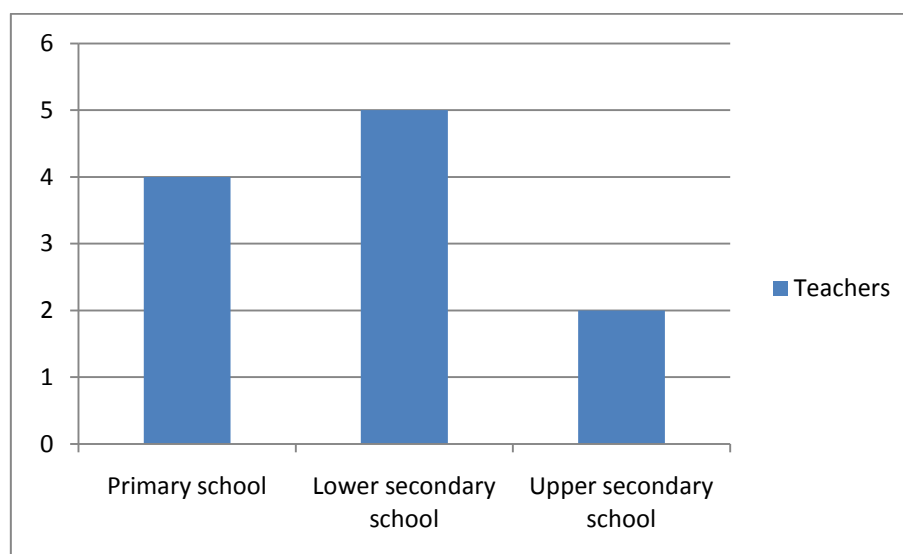


Figure 12. Interviewed teachers' schools

One hundred and three schools were contacted and asked for interviewees for this study. The first step in the communication with the schools was to contact the principal of the school by phone. In the first phone call, the research questions of the thesis were explained. Then the principal was asked if the case company's new online learning environment is in use or has been tried by any of the teachers in the school. Only a handful of the principals could answer the question if the online learning environment had been used in their school by teachers. Those who did not deny that the new online learning environment was used in their school were asked if they could help to find candidates for the interviews. The principals were sent an email that was then forwarded to one or more teachers in the school. One to two weeks later the principal was phoned again and asked if there were any plausible candidates. This was not very rewarding; only seven interviewees were identified this way. The other four interviewees were contacted in different ways. One was met at the case company's marketing event. The other three teachers were introduced to the researcher by the case company's staff.

The interviewed teachers had good computer skills and many years of experience with computers. The younger teachers had used computers in teaching for as long as they had been working as teachers. The older teachers had used computers in teaching from the last decade, approximately for ten years. The description listed in Table 4 is based on how the teacher herself described her own skills. Some perceived their own computer skills as mediocre with a possibility to improve. However, all teachers thought that computer skills were good enough for their profession.

Table 4. Interviewed teachers' computer skills

| Teacher                | Description about own computer skills   |
|------------------------|---|
| Primary school         | Mediocre  |
| Primary school         | Mediocre, can use power point and excel and basic Internet applications and email, basic skills |
| Primary school         | Good enough   |
| Primary school         | Possibility to improve  |
| Lower secondary school | Adequate  |
| Lower secondary school | Mediocre, knows all basic stuff   |
| Lower secondary school | Mediocre  |
| Lower secondary school | Good minus, maybe good  |
| Lower secondary school | Good enough, but don't know how to use an interactive board                                     |
| Upper secondary school | Basic skills  |
| Upper secondary school | Good enough   |

Many of the teachers had used one of the former online services provided by the case company (Figure 13). They had used either the old learning environment or the digital database for learning material provided by the case company. All of the interviewees had used a web service in teaching that was not provided by the case company. Of the eleven interviewees, nine already used the new online learning environment. Two of the teachers had not had time to try it before the interview. Both of them used the old learning environment provided by the case company instead, so these two interviews were somewhat different from the other nine and were more about using an online learning environment in general. However, the same semi structured interview questions were used in these interviews.

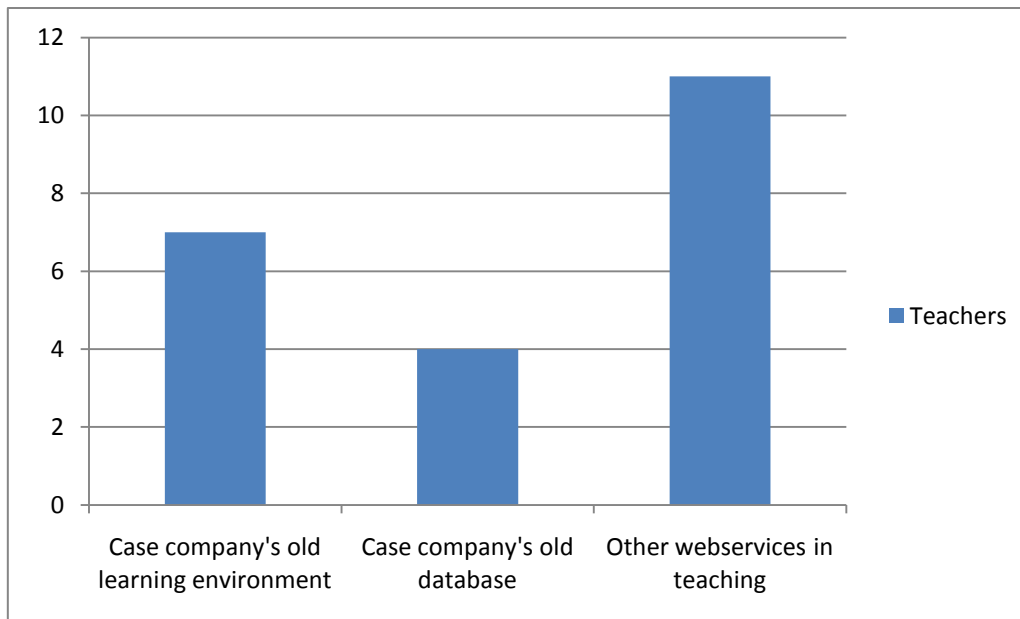


Figure 13. Use of the case company's other online services

#### 4.4 Data gathering and analysis

Qualitative research methods have been used in this thesis to gather data. A qualitative research method is logical to use when investigating processes and human behavior. Qualitative research gives more openness and flexibility towards the research question which is good when dealing with humans. Furthermore, with a qualitative research it is possible to get a deeper understanding of the processes behind the phenomenon (Corbin and Strauss 2008).

For this thesis four different data sources have been used. The first source is results from the case company's own usability tests. The second source is the preliminary interviews made for this thesis. The third and the most important source is the interviews with the users, in this case, primary, lower secondary and upper secondary school teachers. The fourth is an observation of the case company's marketing event.

##### 4.4.1 Case company's usability tests

The case company has conducted three usability tests. In the first usability test, the case company's staff experimented with a preliminary version of the online learning environment. The second usability test was an observation test of a still unfinished version

of the new online learning environment. Teachers completed exercises and at the same time they said out loud what they were thinking. In the third usability test, nine teachers used an unfinished version of the new online learning environment with their pupils in their own classroom. After each session, the teachers were interviewed. The results from the usability tests were used to plan the structure of the interview questions. The results from the usability test also gave an insight into which problems were already known to the case company.

#### 4.4.2 Preliminary interviews

The focused interview method was chosen for the interviews. This method has different phases and begins with finding the focus of a specific phenomenon and then to assure that all the interviewees have experienced a certain event. In this case the certain event is that the users have experimented with the new online learning environment. In the second phase, preliminary interviews are conducted to get a good understanding about the phenomenon and the concepts of the new online learning environment. In the third step the preliminary interviews are analyzed and a frame for the user interview questions is created. The fourth step is the actual user interviews.

Three semi-structured preliminary interviews with the case company's staff were conducted at an early stage of the work of this thesis. The preliminary interviews were conducted in September-October 2010. These were held to get a better understanding about the online learning environment and the concepts behind it. The interviewees were with a content manager, a content producer and a help desk employee. The framework for the interview was the same for both the content manager and content producer. Both the content manager and the content producer had been working closely with the users, and were able to provide information about the concepts of the online learning environment. The structure for the interview with the help desk employee was different because of the different aim with the interview. The help desk employee provided information about the most frequent problems teachers experience with the new online learning environment. The preliminary interviews were recorded and transcribed. A summary of the transcribed interviews with the content manager and the content producer were written. The written summary was used in



the development of the structure of the interview questions. The interview with the helpdesk employee was perceived as useful also in the analysis of the interviews with the teachers. The transcribed interview with the help desk employee was coded and analyzed along with the teacher interviews.

#### **4.4.3 Observation of a marketing event**

The case company arranges marketing events for their newly published books. At these events the online learning environment is, according to the preliminary interviews, also demonstrated. A marketing event in Helsinki 20.10.2010 was observed for this study. Notes were taken during the presentation. One teacher attending the marketing event agreed to be interviewed about the online learning environment afterwards. In this interview questions about the marketing event were asked. The notes were analyzed in the second phase of the coding together with the teacher interviews.

#### **4.4.4 Interviews with teachers**

Eleven teachers were interviewed with a semi-structured interview method in which the questions are the same for everyone but the order of the questions can vary depending on the progress of the interview (Hirsijärvi and Hurme 2008). Results from the case company's own usability tests, the preliminary interviews, and technical literature provided data when designing the questions for the interviews with the teachers (Corbin and Strauss 2008). The individual adoption models TAM 2 and UTAUT were used when constructing the framework of the interview. Questions to each category of the models were developed and then arranged to a more suitable order. See Appendix A for the interview questions.

All the interviews began with background questions about the teacher and her computer skills, and after that the interview questions acted more as a guideline and reminder. All the questions were asked in every interview but in an order which better suited the situation. The aim of the interviews with the teachers was to gather information about teachers experiences with the online learning environment, how they started to use it, the usefulness and benefits offered by the online learning environment, what kind of support they got in the implementation and in the use, and problems and difficulties related to the use of the

online learning environment. Some of the teachers were asked more specific questions based on the information given in the phone discussion or email exchange before the interview.

The interviews were conducted in October and November 2010, shown in Table 5. The interviews were conducted in the teachers' own school; usually in the teachers' own classrooms. Ten of the eleven interviews were recorded and transcribed. Notes were also taken along the side during the interviews. In one of the interviews only notes were taken. The length of the interviews varied, the longest was over one hour and the shortest was seventeen minutes. Most of the interviews were about thirty minutes long. Ten teachers were interviewed in Finnish and one teacher was interviewed in Swedish.

**Table 5. Interview schedule**

|                               | <b>September</b> | <b>October</b> | <b>November</b> |
|-------------------------------|------------------|----------------|-----------------|
| <b>Preliminary interviews</b> | 2                | 1              |                 |
| <b>User interviews</b>        |                  | 5              | 6               |

The coding of the transcribed interviews was conducted in two phases. First, the transcribed interviews were coded with Atlas.ti. Atlas.ti is a software specifically designed to code qualitative data (Muhir 1991, Catterall and Maclaran 1996). The coding was done with the axial coding method. With axial coding a theoretical framework is created to code the material. Two different sets of categories were created, theoretical categories and common sense categories (Bryant and Chamaz, 2007). The coding of the transcribed interview was conducted inductively.

In the second phase of the coding, the categories developed in phase one were analyzed. Categories were first compared to each other to find similarities. In this phase some of the categories with only one or two codes were integrated to each other. This reduced the amount of categories. The analysis continued by comparing the categories to existing models. In the analysis of the results it was noticed that the results had most in common with Rogers' innovation decision process and the UTAUT model. Then the categories were organized according to these two models. The factors in the two models acted as categories.

One new category was created for the innovation decision process, Registration. Many of the codes were placed under more than one of the categories from the models.

A qualitative study includes three phases: gathering of data, analysis and reporting (Corbin and Strauss 2008). The results are reported in Chapter 5 and discussed in Chapter 6. Chapter 5 is divided into three sections. In the first one, 5.1 Critical phases in the adoption process, the results are structured according to West et al.'s (2006) adapted version of Rogers' (2003) diffusion of innovation. The theory was chosen because the results from the analysis match the phases in the theory. In the second section, 5.2 Factors influencing the intention to use, the results are organized according to the Unified Theory of Acceptance and Use of Technology (UTAUT). Carlsson et al. (2006) state that TAM is the most used model and that it has been proven in empirical studies that UTAUT outperforms all the other individual adoption models. The UTAUT model was also the model which had the best fit to the gathered data in the analysis of this thesis. The third section, 5.3 Practices and challenges in using an online learning environment, is purely inductive. It is structured according to findings in the use of the new online learning environment.

## **5. Results**

In this section the results are presented. They were established with the methods and analysis presented in the previous chapter. Many quotations from the interviews are displayed to give a richer example about the found phenomenon. The interviews were originally in Finnish and Swedish, so the quotations have been translated from the original language into English.

This chapter is divided in to three parts. The sections are divided according to the research questions. Each of these sections describes the findings inside the limit of each research question. In section 5.1 the findings for the research question “What are the critical phases in the adoption process?” are discussed. In the next section 5.2 the empirical data related to the research question “Which factors influences the intention to use?” are previewed. In the third section 5.3 discusses findings related to the third research question, “What are the practices and challenges using an online learning environment?”

### **5.1 Critical phases in the adoption process**

#### **5.1.1 Knowledge, persuasion and decision**

Teachers had their first contact with the online learning environment through different channels. Teachers who had used the case company’s other services obtained knowledge about the new online learning environment differently in comparison to the users who had not used the case company’s other digital services.

For teachers who had used the case company’s other online services before trying the new online learning environment, the usual way to find the new online learning environment was by a received email from the case company. The email contains an explanation about the new online learning environment. The other option was that they found it themselves. Users who visited the old learning environment were automatically redirected from the old page to the new one. These users already had experience with the digital material but on another platform. These users chose this online learning environment because of the digital material they had used before.

New users found out about the new online learning environment either from the case company's marketing events or by a recommendation from a colleague. The case company usually introduces new books at marketing events. This is a good opportunity to show the online learning environment to new users. Some of the teachers had their first contact with the online learning environment at a marketing event and for some the marketing events persuaded them to try the online learning environment.

*Eric: Have you been at a marketing event?*

*Teacher: Yes, last winter, we wanted to try their new book so we went there*

*Eric: Was there anything about the online learning environment?*

*Teacher: A little, but not too much*

*Eric: What kind of picture did you get about the online learning environment from the event?*

*Teacher: Well, it interested me, it was one of the reasons we decided to try it, we thought that there is this book we want and then there is also this good and broad online service, it definitely helped us make the decision.*

*- Teacher, lower secondary school*

In the citation above a teacher in lower secondary school answers briefly that she had attended a marketing event. The demonstration about the online learning environment sparked her interest in using digital material. Some of the teachers who had used the case company's old online learning environment or the old database said that they first heard about these in a marketing event.

One marketing event arranged by the case company was visited in Helsinki. No conclusions can or should be made from the observation of only one marketing event; however, the presentation gave the impression that the use of the online learning environment is complicated. One demonstration was made with the online learning environment and how it can be used by a teacher in front of students. The demonstration did not work, and the presenter said after that "this probably was a poor example but I think you got the picture." The demonstrability is important because teachers get ideas about how online learning can

be used. Venkatesh and Davis (2000) stated that implementing an effective system can lead to failure if the perceived usefulness cannot be demonstrated. The teachers make their decision based on how easy it looks and how useful they think the online learning environment will be. One teacher was interviewed after the same marketing event:

*Eric: What kind of image did you get from the presentation they had about the online learning environment?*

*Teacher: Well, it should be practiced, it should, even the presenter said it herself that this is not so accurate, it gives a picture that it is not so easy to use, there was this presenter who was talking this and that, presenting the learning material, beside him was a board, and then the presenter said that show this, and the focus was on two places, and when the board had a touch-it screen, and when the other presenter touched it, all the material went rrrr (laughter), everything went, let's go a little bit down and, and then when she actually found it, we laughed with another teacher that if we would start using this with our pupils, like oops it went there, we wouldn't need to talk about anything else cause the whole lesson goes to watch when the teacher goes up and down in the folders(laughter)*

*- Teacher, lower secondary school*

The marketing event is an excellent way to promote the online learning environment. Some teachers even visit the marketing event to get more information about it. One teacher said that if she wanted help with the online learning environment, she could visit a marketing event. As mentioned earlier, no generalizable can be made about the problems in all marketing events by attending only one. It could be that at some events the use of the online learning environment is demonstrated more clearly. However, the importance of demonstrating the ease of use of the new online learning environment is strongly emphasized. One key factor which affects the perceived usefulness in TAM 2 is result demonstrability.

### 5.1.2 Registration

Registration is a separate section. In the preliminary interviews with the case company's staff it was already pointed out that registration to the new online learning environment is difficult. An employee of the case company's helpdesk said that, ninety percent of incoming calls and emails are teachers asking for help with the registration. Almost half of the interviewed teachers had problems with registration. Because of this, registration was given its own section.

To use the digital material in the online learning environment, the teachers have to sign into the system. Before that they have to register. There are three different ways to register to the online learning environment classified by regions and for old or new systems. The first registration method is for teachers in Helsinki. They can log in with their username provided by the city, which they also use for email and other services. The second method is for users of the case company's old learning environment. They can log in to the new system with their old username and password. Both of these methods require the teacher to answer some basic questions the first time she signs in. The third method is for teachers outside Helsinki and for teachers who have not used the case company's other learning environments before. They must register to the online learning environment and answer questions about their school and which books they use. Then they have to activate their account twice. First they receive an email with an activation link which they have to use within seven days. After that they will receive an activation code to their school which unlocks their username in the online learning environment. This is done to ensure that the user is a teacher and working at a school. The case company had in some cases sent the activation code to the school in advance to speed up the process.

Many of the teachers registered to the new online learning environment in August when the new version was released and the school term began. The amount of emails sent to the case company's help-desk peaked at this time. They received between 370 and 500 emails per week in August as shown in Table 6. According to the staff at the case company's helpdesk, about ninety percent of these emails regarded registration to the new online learning environment. A normal week consists of about one hundred received emails about the new online learning environment. The case company does not categorize and analyze the incoming emails. Analyzing the incoming emails could give great insight and indicate if the

problems occur because of poor interface, poor computer skills, lack of information, or some other problem.

**Table 6. Emails received by the case company's helpdesk 9-29.8.2010**

| <b>Time</b>         | <b>Received emails</b> |
|---------------------|------------------------|
| <b>9-15.8.2010</b>  | 409                    |
| <b>16-22.8.2010</b> | 499                    |
| <b>23-29.8.2010</b> | 373                    |

Among the teachers who were interviewed, eight are from Helsinki, two are from Espoo, and one is from Vantaa, see Table 7. One of the teachers from Espoo has also used the old learning environment, so she should have been able to sign in with her old username and password. The other teacher from Espoo and the one from Vantaa needed an activation code to register. The helpdesk indicates that the teachers have had many problems with the activation code. This could not be confirmed in this study because of the small amount of interviewed teachers who had registered with an activation code.

**Table 7. City of the interviewed teachers**

|                 | <b>Number of teachers</b> | <b>Problems with registration</b> |
|-----------------|---------------------------|-----------------------------------|
| <b>Helsinki</b> | 8                         | 2                                 |
| <b>Espoo</b>    | 2                         | 2                                 |
| <b>Vantaa</b>   | 1                         | 0                                 |

Three of the four teachers had the same registration problem. None of the three teachers had been in contact with the helpdesk about the problem. This means that the amount of teachers who have had problems with registration is likely much greater than the amount of



emails and phone calls the helpdesk has received. One of the teachers figured out the problem by herself and one consulted a colleague. In another case the registration problem was so critical that the teacher was not able to use the online learning environment at all because of it. The source of the difficulty lies in an unclear user interface. Poor error messaging also contributed in the case when the teacher had not used the new online learning environment. The registration part was not tested in the case company's own usability testing, which is probably the reason why it was so problematic.

In the other registration problem, the teacher said that the registration was very easy, but at first she did not know how the new system worked or how to register, so she contacted the case company's helpdesk. She sent an email to the helpdesk asking them if they could register her. The helpdesk registered the teacher and sent her the activation code. This teacher was very pleased with the service provided by the helpdesk.

The registration process is a onetime event and most of the teachers did not mind the problem. They did not see the problem with the registration as a poor user interface, more as a mistake that they made themselves. The teachers who had no problems thought that the registration was easy. One teacher even praised the system because she could sign in with the same username and password as before.

*"People have so many usernames nowadays, so it is extremely good that it is possible to sign in with same and nothing else is needed"*

*-Teacher, lower secondary school*

### **5.1.3 Experimentation**

All of the teachers experimented with the online learning environment with an informal learning method called trial and error. Trial and error means that the user tries the new online learning environment alone, without any external help (Korpelainen and Kira 2010). The self learning was somewhat limited to those parts of the online learning environment they knew about. They avoided those parts of the online learning environment they did not know about before.

A teacher in upper secondary school participated in a marketing event hosted by the case company. This was not the same marketing event as the researcher visited. In the marketing event, the case company demonstrated how to use the online learning environment to create exams for students. This teacher used the online learning environment only for creating exams in the exact same way showed at the marketing event. The exams are in the folder box in the online learning environment. She had not tried the other two modules. She also could not answer what the functions of the applications were.

The same situation occurred with every teacher who used the new online learning environment. They all started to use only one of the applications in the online learning environment, and this application was also the reason why they choose to use the online learning environment in the first place. Some used it because of the slides and animations and others used it only because of the exercises for students. There were also some teachers who only used the new system to print out handouts for the students.

As explained earlier, the new online learning environment contains three modules: the folder, the drag and drop box, and a repository for the student keys. All the interviewed teachers who had used the new online learning environment had used the first module, the folder. Every interviewed teacher thought that the folder module was easy to use. They thought that it was effortless and did not spend much time on familiarizing themselves with the online learning environment. They compared this part of the online learning environment to other computer programs and Internet services they often use. One teacher said, that the logic in the folder module is the same as in an online bank and that everyone who has used an online bank should be able to navigate in the new online learning environment.

None of the interviewed teachers had experimented with the second module, the drag and drop box. Only one of the teachers could explain the function of the second module, and she only knew it because she had participated in a training session about the online learning environment the day before the interview. She admitted that she did not know what it was before the training and that she had not yet tried it. The other teachers had not used the drag and drop application. They did not know what it was and what it was supposed to do. After the teachers had been asked about the drag and drop box, and after they answered

that they did not know what it was, what can be done with it and how it works was shortly explained. Most of the teachers responded that it now looked easy and useful and that they would start to use it right away.

Only half of the interviewed teachers had tried to use the student key. The other half had not used the student key and could not explain the purpose of the key or how the key could be used. Some of the teachers who did not know about the student key still used the digital material designed for students. Two teachers signed in with their own account for the pupils. Pupils could then in small groups or individually do exercises signed in as the teacher. These teachers opened the exercises from the first module, the folder.

One teacher used the student key without using this student key module. She got the student key in the same email as the activation code. This was a little bit confusing for the teacher.

*Eric: How have you used the student key?*

*Teacher: Well I got this student code which I gave to a student, I only gave the code to her and then she managed herself to create a username and password with that code.*

The teacher in upper secondary school, in the citation above, thought that the student key was an activation code for students. She thought that students had to create their own account for the online learning environment. According to the teacher, the student had managed to solve the mystery with the student key and had accessed the digital exercises.

None of the teachers had asked for help or explanations about the drag and drop module or the student key module. The problem is not that the applications are not working but that they consider these two features as optional. How can teachers ask for help if they do not realize they are missing out on something? It is much easier to ask for help if one knows that something is wrong. The solution is to push the information from the case company to the teachers rather than waiting for the teachers to pull the information by themselves.

#### 5.1.4 Technical Challenges

In the trial and error phase, some teachers noticed that they had wrong or missing digital material. The digital material was assigned to a teacher's profile based on the questions answered in the registration form. There could be an entire book series or a student key missing from a teacher's profile. Usually the material was missing from the first module, the folder, or then a student key was missing. Some had the wrong material in their drag-and-drop module. The wrong material in the drag-and-drop module made the feature more confusing and could be a reason why so many had not tried it, as explained in the previous section, 5.1.3 Experimentation.

When digital material was missing or there was wrong material in the user profile, the teachers knew that something was wrong with the online learning environment. In most of these cases the interviewed teacher contacted the helpdesk to get help with the problem. Before contacting the helpdesk, the teacher compared her own digital material and user profile with her colleagues to confirm that there was something wrong. Calling or sending an email to the case company's helpdesk was perceived as time consuming and tough. One teacher said that she had intended to call the helpdesk for a while but she has yet to find time for it. Before contacting the case company a teacher usually discusses the problem with her colleagues. If that does not help, she asks the ICT-support person at school, if there is one. Calling or sending email to the helpdesk is usually the last action a teacher takes when she encounters a problem.

Another challenge for several of the teachers concerned the out-of-date software and lack of computers in the schools. They were either missing the proper software or missing an update to an application. Teachers did not blame the online learning environment for this problem. They knew the problems were with the school computers and not the online learning environment. All who had this problem explained that it is normal, and that it happens. Even though this problem is not blamed on the online learning environment it affects the use of it.

*“Teacher: And then there is the technical side, a number of the exercises are so demanding, they need java and they need media player, or some kind of player,*

*and then it depends which computer is used, is it working or not, it could be that it loads one exercise for minutes, but the problem is more with the computers, there is no problem with the digital material or the online learning environment.*

*Eric: What do you do if it doesn't work for example if java update is missing on a computer?*

*Teacher: Then the student jumps to the next exercise, because not every exercise needs java."*

The problematic issue with missing software updates is that no one seems to fix the problem. When a problem occurs, the teachers usually instruct the students to skip the exercise or change to another computer. One teacher said that it is always the same computer that does not work. The teachers do not inform anyone about the problems, so they are not fixed and the same problem will of course occur on the same computer again. Each school has a computer support person who repairs the computers and updates software. Teachers do not usually have permission to update software, so they need to get the ICT support person to help. In many schools this service is outsourced, which makes it more challenging for teachers to report the problem.

### **5.1.5 Integration Challenges**

As explained earlier, most of the teachers were familiar with using technology in classrooms. There were also no larger problems with integrating the use of the online learning environment into everyday teaching. Many of the teachers explained that using digital material is already a part of teaching. Features which are similar to features in other software currently used were straightforward to integrate. Known features are for example navigating through folders and using digital content with a projector. Teachers struggled to understand how they could use the entirely new features introduced in the new online learning environment.

The concept of the student key was perceived as challenging for many teachers. Only half had tried to use the student keys. Almost all of the teachers who used the student key had encountered some kind of problem. Many of these problems occurred because of lack of information. Teachers had no information about the applications. The problem was not in how they were used in the interface, but occurred because this service was completely new for teachers and the concept was unclear to them.

*“But here for example I have been thinking that are we allowed to, I haven’t had the time to familiarize with the rules, but how long is this key working, a month, a year, this is a little bit unclear to us, and are we allowed to give the key to the students so they can for example do these exercises as homework, so this is what we have been wondering with my colleagues”*

- Teacher, lower secondary school

In the example above, a teacher in a lower secondary school wonders if she is allowed to give the student key to the students. She had discussed the problem with her colleagues without getting an answer. Instead of taking a risk to break the rules, this teacher decided to use another service on the Internet and simply gave a link with those exercises to the students.

It was also unclear for another teacher how the student key can be shared. However, this time it was the opposite problem. The teacher used her school’s online discussion forum as an information channel. The discussion forum is public, anyone can access it. The teacher posted the key to the student material on this public forum. She wanted to give the student key to the students preparing for the matriculation examination. The students and the teacher had no any classes together before the exam, so she could not give the key to the students in the classroom. She knew no other way to inform them than publishing the code on a public forum. This teacher was not the only one who posted the student key on a public discussion board. These forums are very easy to find with a search engine. When using the

most common words about the new online learning environment on a search engine, about ten different student keys can easily be found.

Some teachers found the use of the key time consuming. One teacher said that having to explain to the students how to use the key always took time. Some students were often late which disturbed the lecture because she had to start over and explain about the key again. She added that this could be a problem that fades away when the students become more used to using the student key. Another teacher who had the same problem was a special class teacher. She said that going to the computer room and helping the students to sign takes time. If they, in addition to their username and password, need a key to access the exercises they will not have much time to actually do the exercises.

#### **5.1.6 Increased Comfort Level**

Teachers tried the new online learning environment for the first time in autumn 2010. The interviews were made in October and November the same year. Some of the teachers had briefly visited the new service by themselves. Most of teachers had already used it in the classroom. However, they had not reached the phase of Increased Comfort Level. Almost all of the teachers still had unanswered questions about the use of the new online learning environment. The Increased Comfort Level and the steps after it are therefore not addressed in this study.

According to West et al. (2006), when the user feels an Increased Comfort Level, he or she starts to adapt the system to personal needs. Teachers will re-invent some of the features to better suit their on-the-job tasks. This had not happened yet with the teachers in this study, and many of the teachers were still using only one feature of the new online learning environment and only in the way it was planned to be used.

#### **5.1.7 Summary**

In section 5.1 the phases a teacher experience adopting the new online learning environment are presented. The results in this section answer the first research question, “What are the critical phases in the adoption process?”

An overview of all the critical phases is shown in table 8. As explained, in the first three steps are Knowledge, Persuasion and Decision. In this phase the importance of the marketing event and the demonstrability of the online learning environment should be emphasized. The critical phases in the Implementation phase are Registration, Experimentation, Technical Challenges, and Integration Challenges.

Table 8. Critical phases in the adoption process

| Phases of Adoption                    |  |   |
|---------------------------------------|--|---|
| Knowledge,<br>Persuasion,<br>Decision | Old user of case company's online services:  |   |
|                                       | a) Email from case company<br>b) Redirected from old page to the new online learning environment |   |
|                                       | New user:  |   |
|                                       | a) Colleagues<br>b) Marketing event  |   |
| Implementation                        | Registration   | Problematic because of user interface   |
|                                       | Experimentation  | Self determined trial and error limited to known applications<br>Teacher need more information  |
|                                       | Technical Challenges   | Technical problems in system<br>Unclear concepts  |
|                                       | Integration Challenges   | Teacher has experience with digital material, no larger problems integrating the online learning environment<br>Some problems with new features |
|                                       | Increased Comfort Level  | Teachers not yet in this stage  |



## 5.2 Factors influencing the intention to use

### 5.2.1 Performance Expectancy

*Eric: "Do you feel that you receive any benefits when using this new online learning environment?"*

*Teacher, lower secondary school: "Of course, I wouldn't use it, if I felt that I wouldn't gain something."*

The citation above explains how teachers are feeling about the new online learning environment. They will only use it if they feel that the new technology is useful. Every single interviewed teacher felt that the online learning environment helped in some way with their daily routines.

One teacher felt the benefit with the online learning environment is that she has a reason to use all the new equipment the school purchased. This teacher had a new interactive board in her classroom. Without the online learning environment, the equipment would not be utilized. She felt that it would take enormous amounts of time to create her own animation and digital material to use with the interactive board. This teacher felt the online learning environment was a great advantage in this respect.

Some teachers said that the new online learning environment saves time. For one teacher it saved time because all the digital material is in one place. Without this online learning environment she would still use digital material, but she would have to spend much more time on searching the Internet for value adding digital material. Now, the teacher can just sign in to the new online learning environment and choose what she wants to show. The teacher using the online learning environment to create exams said that without the online learning environment she would print out and then cut questions and glue them to a paper. With the online learning environment, she can reorganize and edit questions from a database, which saves her time.

One special education teacher brought up that making the education more personalized is the biggest benefit of the new online learning environment. This is also one of the benefits

listed with blended learning in the section 2.2 Blended learning. Variation to teaching and motivating the students are other benefits teachers get with the online learning environment.

*“I think many of the pupils who cannot focus on what I am telling (laughter), wake up when I turn on the interactive board.”*

- Teacher, primary school

### 5.2.2 Effort Expectancy

Teachers expect the online learning environment to be easy to use. They perceive their job as a teacher to be time consuming and stressful, so every additional task is seen as a challenge. Most of the teachers do not want to spend time on tasks not directly related to teaching.

The new online learning environment is perceived as easy to use. Teachers did not need to invest much time in becoming acquainted with it. Most of the teachers started to use the online learning environment straight away in teaching. In comparison to earlier findings this is very fast. Teachers are already used to use digital material on different learning platforms. The user interface and the navigation of a new online learning environment are similar to other programs which help to ease the process. However, new concepts and new ideas are harder to scope. Unfamiliar functions and applications are not used because of the uncertainty of the usefulness and how much effort and time it will take.

Planning the lecture takes less time when they use digital material from the online learning environment. Teachers do not have to prepare their own slides or exercises.

*“It takes less time, when I know what there is, I can just decide that we are going to use that and then I don’t have to think about it anymore, for example if I would create the same exercises on a handout it would take much more time.”*

- Teacher, primary school

The problem is that teachers only use digital material they know about. They prefer not to spend time searching for new material. It makes it faster to search for material when the digital material is organized according to the book in the new online learning environment. This is appreciated by the teachers. However, teachers want to familiarize themselves with the digital material before using it with the students. Once this has been done, they can use the same material year after year. It takes some time to find good digital material from the folders, but it is much less than not having everything in the same place. For example, when they have used the slides once they know where to find them again.

### 5.2.3 Social Influence

The online learning environment has little visibility among teachers. The interviewed teachers did not know if other teachers in the same school used the online learning environment, and they also did not know what the other teachers in the same school thought about it. However, some knew the opinions of those who teach the same subjects about the online learning environment. These teachers said that the other teachers had similar problems and liked the same components; yet most of the teachers did not know their colleagues' opinions about the online learning environment.

*Eric: "Do you know if this online learning environment is widely used in your school?"*

*Teacher, lower secondary school: "I haven't talked with so many about this, so I don't know."*

*Eric: "Do you know what they think about this online learning environment?"*

*Teacher, lower secondary school: "No, I don't know."*

One of the teachers asked in the interview how other teachers use the online learning environment. This is the same teacher who only used the online learning environment to create exams. Teachers had not been able to see their colleagues to use the system.

Students like the online learning environment. Many teachers use it because they know that students like interactive lessons with animations and digital material. Some of the teachers answered the question “Do you think this online learning environment is of any benefit to you?” by telling that the greatest benefit is that it is easy to motivate the students with digital material. Teachers using some kind of digital material perceive themselves as cool in the eyes of pupils.

Many of the schools visited had brand new equipment, especially the schools in Helsinki and Espoo, which had new interactive whiteboards. This is also putting pressure on teachers to use digital material. It is voluntary for teachers to use digital material or online learning environments. School strategies and principals encourage teachers to use digital material in teaching. In the end, the teacher is still the one who decides if she is going to use digital material in class or not. All interviewed teachers used the online learning environment voluntarily.

#### **5.2.4 Facilitating Conditions**

One of the interviewed teachers in lower secondary school participated in a training session at her own school about the use of the new online learning environment. In the training session she was introduced to the different modules. She pointed out that it was useful to get information about the drag and drop application and that she would not have found it by herself. She found the training session very useful and said it gave many new ideas on how to use the online learning environment.

Her school had been contacted by the case company's local marketing agent who offered the training session. The teacher said that she had no clue that the case company was offering this kind of service and was very pleased by the offer. When I asked if there was anything she wanted to change in or about the online learning environment she answered:

*“In fact there is, when we got the information and the activation code, that they would have mentioned about this kind of training session, we would have booked it much earlier in the autumn, because it was very useful when there were only a couple of teachers and one was giving instructions the whole time, and we got to use our own computers, in that way you learn at the best, so I would recommend that when the case company sends out the activation codes to the schools that they would also tell about the training, because we didn’t know that this was possible.”*

- Teacher, lower secondary school

Almost all of the teachers said that they would have needed some kind of information about the new online learning environment in the beginning, but could not explain what would be the best way to inform them. Instead, they said they do not want any lengthy manuals that take ages to read and that it has to be something really simple. None of the interviewed teachers knew about the possibility to get this kind of guidance to use the new online learning environment from the case company. This is proposed as a further research question.

The teachers wished for more information about why the online learning environment has changed. Some teachers complained that there was some digital material in the old learning platform that they were using and that they cannot find it in the new one. They were wondering if it was somehow possible to get the old material back, which they already were familiar with. The concepts of what materials are free and what must be purchased was confusing. They were also wondering what will happen with the new online learning environment in the future and also what will happen with the old learning environment in the future. It is important for teachers to know that this online learning environment is not only a temporary phase. Because when they put time on getting acquainted with the digital material they want to be able to use it for many years.

*“Why has these changes been made and if here is some kind of limitations what digital material can I use, I would like clarifications about that, cause now I do not know why I have two books here in the online learning environment, which I don’t even use, so I have the authentication to use them but not to any other digital material which I used in the old learning platform, which could be very useful”*

- Teacher, primary school

In the citation above, a teacher in primary school tells what kind of information she would have wanted when she started to use the new online learning environment. This teacher did not contact the case company. The same teacher also said that she is willing to pay for the digital material but does not know how.

As shown in the previous section, schools have good computers and computer accessories that facilitate the use of digital material. Sometimes it even puts pressure on teachers to use digital material because they have new equipment.

### 5.2.5 Summary

In section 5.2 Factors influencing intention to use are discussed based on the gathered data and answers the second research question: “Which factors influences the intention to use?” The section is structured according to the UTAUT model and divided into four sections: performance expectancy, effort expectancy, social influence, and facilitating conditions. Table 9 shows the summary of factors influencing the intention to use.

Table 9. A summary of the factors influencing the intention to use the new online learning environment

| <b>Factors Influencing the intention to use</b> |  |
|---|--|
| <b>Performance Expectancy</b>                   | +The online learning environment improves the effectiveness of job tasks and motivates students. Every teacher felt that they gained something by using the online learning environment.   |
| <b>Effort Expectancy</b>                        | <ul style="list-style-type: none"> <li>+Perceived as easy to use</li> <li>+Fast adoption, not much time spent to get acquainted with the online learning environment</li> <li>-Even small technical problems where user has to contact helpdesk is found stressful</li> <li>+Digital material in general decreases the planning time of a lecture</li> </ul> |
| <b>Social influence</b>                         | <ul style="list-style-type: none"> <li>-Little visibility among colleagues</li> <li>+ Students like it</li> <li>+ Principal and the school environment encourage teachers to use digital material</li> </ul>   |
| <b>Facilitating Conditions</b>                  | <ul style="list-style-type: none"> <li>+ Good equipment in schools</li> <li>-Lack of information</li> </ul>  |

### 5.3 Practices and challenges in using an online learning environment

This section begins with a description of how teachers search digital material in the new online learning environment. Then a discussion about why teachers use digital material in teaching. The last part of this section includes a description of how teachers use the online learning environment.

In Finland, there is a national curriculum which teachers have to follow. It includes all the topics which the students should learn each year, and school books follow this curriculum. By following the book the teacher will teach everything necessary according to the curriculum. Many of the teachers plan their lectures according to the book which is still the main resource for teachers. When using digital material, almost all of the teachers first used the book to search a topic, and after that they searched the online learning environment for digital material. The digital material in the online learning environment follows the same structure as the book. This helps the teacher to find the right material in the online learning environment.

Teachers use material that they have used before or material that they have heard is good. Teachers do not want to spend time in searching for new material. The digital material of the online learning environment follows a book, which makes it easier to navigate. Teachers want to study the digital material before using it with the pupils. Some of the interviewed teachers said that it is easy to find material. Some thought that it is easy to find but as explained, it takes time to check the material.

All of the teachers had used some kind of digital material in teaching. In addition to the different publishers' digital material online, the following services were used: Youtube, Perunakellari, Papunet, Mopedkoulu, Ekapeli, Kirjakuja and Wikipedia. Teachers also use search engines to find appropriate content to enrich teaching. Teachers used different digital material for different purposes. One teacher used the new online learning environment for some specific area and another web services for another.



*“If we for example talk about the Niagara falls, I google Niagara falls, so that we know what the Niagara Falls looks like, and then we watch a video clip of someone going down the Niagara falls in a barrel”*

- Teacher, lower secondary school

In the example above, a teacher in lower secondary school explains how she uses the material on the web in the classroom. This teacher uses digital material to explain or demonstrate facts and figures. Another teacher in lower secondary school used it to demonstrate things that otherwise are not possible to demonstrate as shown by the citation below.

*“In Physics and Chemistry, I use these animations and demonstrations which can’t be showed in class anymore because the substance required to create a chemical reaction are forbidden”*

- Teacher, lower secondary school

Most of the teachers stated that they use digital material to add variety into the lecture. They said that it is easy to motivate students with digital material. Some even used the online learning environment as a reward system for students.

*“I usually use the online learning environment in the end of the lecture, it is very motivating for the pupils. Everybody likes it, and they work really hard if they know that they can play with the computer in the last fifteen minutes of the lecture”*

- Teacher, primary school

The online learning environment is used in various ways by teachers. Some used the digital material developed for teachers while others used the exercises meant for pupils. Some used it to print out material. As explained in section 6.1.3 Experimentation, most of the teachers used the online learning environment only for a single purpose.

Different teachers used the exercises for students in different ways. Teachers in primary schools and lower secondary schools go to the school's computer classroom once a week, where students do exercises. Teachers in upper secondary school do not go to the computer room with their students. Only two teachers from upper secondary school were interviewed, so the sample size was too small to draw any conclusions. This is a phenomenon which could be further researched. If teachers in different grades use the online learning environment differently, then the online learning environment should have different functions for these teachers. Based on this, it seems like students in both lower and upper secondary school had no problem with grasping the concept of the student key. However the teachers are the ones who distribute the keys to them. To these teachers the concept of the student key was unclear. Some of the teachers in lower and upper secondary school said that they do not use the student key with the students. The main reason for this is because they cannot check if the student does the exercises in the online learning environment. Students can be very lazy with their homework, and if they know that the teacher is unable to check what they have done, they will not likely do it. These teachers told the students that there is a key. With the key they can access exercises to prepare for exams. If the teachers could check what students have done in the online learning environment, exercises from the online learning environment could be given as homework. In this case the benefits of blended learning discussed in Chapter 2 would be recognized. The exercise in the online learning environment could immediately correct wrong answers for students, and the teacher would know if the student correctly completed all the exercises. It would also take less time to check the students' homework. This would allow more time for teachers to improve face-to-face learning for students.

In conclusion, there are mainly two different variations of utilization of the student key that the interviewed teachers used. One is for teachers to go with the students to a computer classroom, and the other is that pupils can rehearse by themselves with exercises on the new online learning environment.

## 6 Discussion

In this chapter, the results are first discussed based on earlier studies and then suggestions are made. This study is evaluated in section 6.2. In the last section of this thesis, further research questions are proposed.

### 6.1 User adoption of the online learning environment

Digital material is widely used by teachers. In addition to the online learning environment, teacher use many other services on the web. The question is no longer whether teachers are going to use computers or not. The question is which provider of online learning materials they will choose. The adoption of the online learning environment has been somewhat effortless with the exception of some problems that occur in different phases of the adoption.

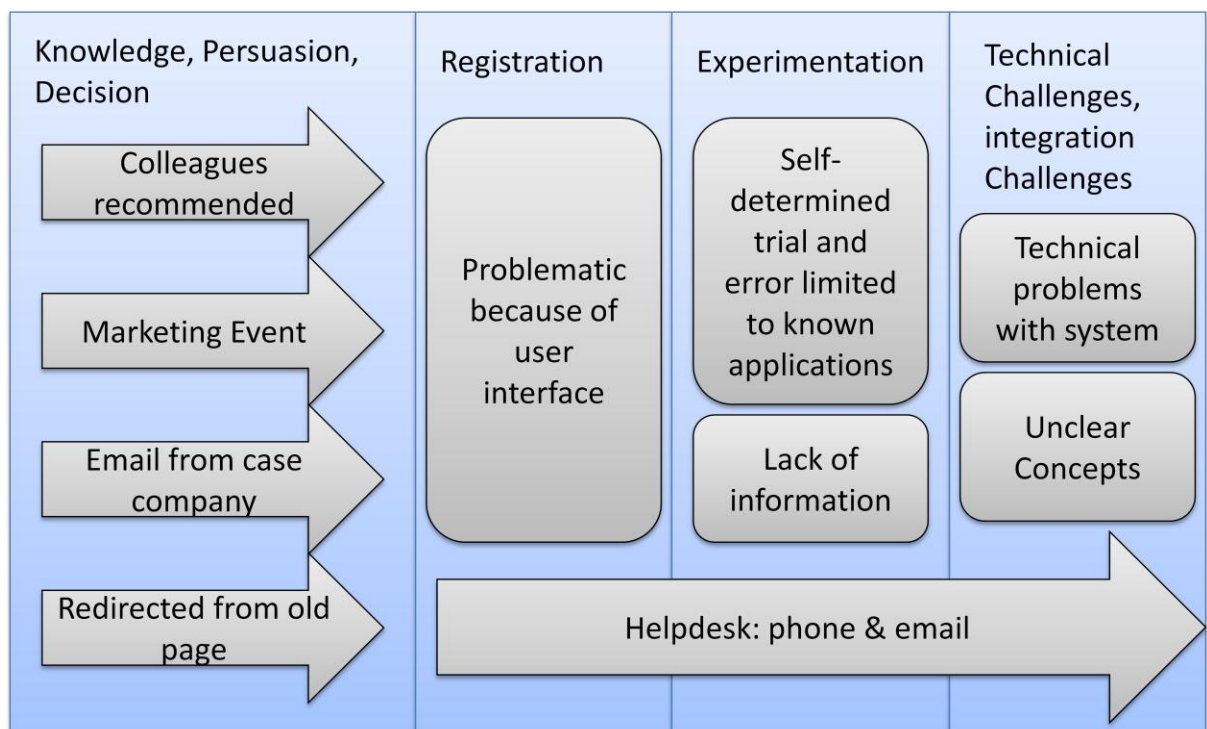


Figure 14. The mapped adoption process of the new online learning environment

Figure 14 shows the summary of the phases a user experiences when adopting a new online learning environment. According to Rogers (2003), the process starts with Knowledge, Persuasion and Decision. In this study four different ways to get the first contact with the online learning environment was discovered, shown in Figure 14. When decision has been made to try the new online learning environment, the user has to register to the online learning environment. Some of the teachers encountered problems in the registration process. This was due to a poor interface. When signed in, teachers were able to experiment with the online learning environment. Most of the problems in the Experimentation phase were a result of the lack of information. They only experimented with those parts of the online learning environment they knew about, so with more information they could have used more features.

The use of only a few features of a new system is in line with earlier findings. West et al. (2006) researched the adoption of a Blackboard device by instructors. They found that instructors started using the Blackboard because of one of its features. Over time when they became more secure with the first application they used, they moved on to new features. So it could be that even with more instructions the teachers would still not use more than one feature in the beginning of the adoption of the new online learning environment.

The lack of information was also a problem for teachers experimenting with some of the new features. Teachers who wanted to use the exercises with students had problems grasping the concept of the student key, so the theory that users test with only one feature did not apply for these teachers. They clearly wanted to use the exercises in the online learning environment with students but did not know how. The lack of information had a negative impact on actual use, not on intention to use. They had decided that they wanted to try the online learning environment before they encountered the problem. The lack of information is a facilitating condition, and this finding is also in line with the UTAUT model which proposes that it affects the actual use.

Teachers began using the new online learning environment voluntarily. According to UTAUT, social influence should not significantly impact behavioral intention when adopting a new technology voluntarily. This is partly true according to these results. Teachers had not discussed with their colleagues about the use of the online learning environment or of

opinions about the online learning environment. This could mean that social influence has a small impact on their decision to adopt. However, students' opinions were important to many teachers. This has a positive effect on the adoption. This applies for other digital media from other publishers also. Students like animations and using computers in general.

Every interviewed teacher felt that she gained something by using the online learning environment. Most of the benefits can be looked at as benefits for digital material in general. When asked what kind of benefits the user gets from the online learning environment, teachers answered that using digital material and animations motivates students. Every teacher also said that she is using many other services on the web. So in general, the school environment has a positive social influence on the intention to use digital material. Schools are investing in new tools that support the use of online learning environments which encourage teachers to use digital material. Students are motivated by features in the online learning environment. Some of the benefits can be related directly to this online learning environment. The benefit of having all material in one place was perceived as positive. In section 2.2 Blended learning it was discussed that some of the benefits with blended learning are: improved pedagogy, increased flexibility, personalization of teaching, and increased cost effectiveness. In this study the customization of teaching to a student's individual needs was also found. Teacher felt that the online learning environment motivated students, so it could indirectly mean that it improved the pedagogy of teaching. The cost effectiveness was not perceived by the teachers in this study. Another benefit that was found in this study is the increased time effectiveness. Teacher spent less time on preparing a lecture when using digital material.

No conclusions can be made about the contribution of age and gender to the different factors. According to UTAUT both age and gender affects factors influencing the usage behavior. All of the participants in the interview were women, and differences in the effect of users in different age about effort or performance expectancy could not be drawn from the result. Both young and older teachers felt that their job is stressful and that they do not want to use time on anything that is not directly related to teaching, like learning to use a new tool.

### **6.1.1 Theoretical implications**

The findings in this thesis are in line with Rogers' explanations about the adoption of a new innovation. A new subheading, Access, is proposed as the first step in implementation phase. A user who is adopting a new system must get access to it. In this study the user had to register to the service. Access is a onetime event but it is perceived as challenging it could lead to a rejection of the service.

- 1. Knowledge**
- 2. Persuasion**
- 3. Decision**
- 4. Implementation**
  - a. Access**
  - b. Experimentation**
  - c. Technical Challenges**
  - d. Integration Challenges**
  - e. Increased Comfort Level**
  - f. Adaptation**
- 5. Confirmation**

Interviewees had not reached the phase of increased comfort level with the new online learning environment. This phase and the steps after it, adaptation and confirmation, are therefore not discussed in the result part of this study and could not be further analyzed. Increased Comfort Level, Adaptation, and Confirmation are entirely reliable on earlier findings.

No changes are proposed to UTAUT. There was one contradiction in the results compared to UTAUT. According to UTAUT, Social Influence has a small impact on Behavioral Intention when a system is adopted voluntarily. The new online learning environment was adopted voluntarily by teachers. However, students' attitude towards digital material had an impact on teachers' behavior. Besides this contradiction, the findings are in line with the UTAUT model.

### 6.1.2 Suggestions

In the first phase of adoption, knowledge, many teachers are introduced to the new online learning environment at a marketing event. Demonstration about new technologies should be carefully planned. Many users will make their decision to adopt based on the demonstration, how useful the online learning environment looks and how easy they perceive it is to use. Venkatesh and Davis (2000) stated that implementing an effective system can lead to failure if the perceived usefulness cannot be adequately demonstrated. Examples used in demonstration should be such that the user can easily implement them in her or his work environment.

In general the biggest problem recognized in this study after the registration phase is the lack of information. The information should be easily available to users immediately after the registration. All of the teachers encountered some problem when they started to experiment with the new online learning environment. Most of these problems could probably have been solved with more information about the service. Teachers' computer skills are good. The information should not be about what should be clicked to open a file. The information should include a demonstration how the online learning environment can be utilized.

When conducting usability tests the registration should be tested. This study shows that difficulties in the registration can lead to an unused system. In addition to usability tests it is also recommended that the adoption and use of a new system is researched. In a normal usability test it can be challenging to grasp difficulties users have with the concept of the system and what affects the adoption. Interviews are an effective way to recognize challenges with a new system. In addition to interviews, diaries and cultural probes are also good data gathering methods, but more time consuming for the user.

## 6.2 Evaluation of the study

This study can be considered to be successful. Relevant theories have been used to research the adoption of the new online learning environment. Problems in different phases of the adoption have been found and documented in this thesis. The gathered data was sufficient to answer the research questions. After only nine interviews, a pattern became evident in

the answers, and no new groundbreaking data was found (Bryant and Charmaz, 2007). Two more already booked interviews were conducted after this.

When conducting qualitative research the researcher is in constant interaction with the data. The researcher's experience influences the results of a qualitative study (Corbin and Strauss 2008). In this study the researcher is rather inexperienced with conducting qualitative research which could affect both the gathering and analysis of the data. However, the researcher possesses the characteristics of a good qualitative researcher. Corbin and Strauss describes a good qualitative researcher to be able to: step back and critically analyze the data, recognize bias, think abstractly, be flexible and open to criticism, react sensitively to situations and objectives, devote her- or himself to the work process

The interviews with the teachers were the main method to gather data in this study. Interviews were chosen because of the nature of the research questions. The objective with the research questions was to identify and describe phenomenon in the adoption. Other qualitative research methods could have been used instead of interviews to gather data, for example diaries (Bolger et al. 2002) or cultural probes (Gaver et al. 1999). When designing the research method, the cultural probes seemed to be too time consuming for the teacher. Because of the unclear frequency of use of the online learning environment the diary method was not chosen. If the teacher would have used the online learning environment once a week and the period for the diary would have been one week. Then the teacher would have written in the diary only once. A longer period for the diary method in this study was also perceived as inappropriate. Afterwards, when evaluating the study, it seems like the interview was the right method to gather data.

When searching for candidates for the interviews, the principal of a school was phoned and asked if there was anyone who had used the new online learning environment. The principal then recommended a teacher. As a result of this recommendation, there is a substantial risk that the teachers interviewed had better computer skills than an average teacher. They were likely asked by the principal to participate in the research because the principal knew that the teacher had the appropriate computer skills and probably had used the online learning environment. These teachers were early adopters of technology and would probably be more to the left in the adoption life cycle (Figure 7). This strengthens the results presented



about the lack of information and problems. If the teachers with the best computer skills had problems, teachers with less experience with computers might have greater challenges with the online learning environment. Teachers with poor computer skills could in addition to these findings confront other problems and additional information would be necessary.

In the analysis of the gathered data, the first phase of coding the interviews was conducted inductively. The second phase of the coding can be argued to be deductive. The coded material was compared to different models. Then the categories were organized according to the best suited model. Even though the chosen model was the best suited it could be that because this happened deductively, the model interfered with the results. Strauss and Corbin (2008) consider a research analyzed with inductive methods to approach the truth better than a research analyzed with deductive methods.

Emails from the helpdesk could have been used as an additional data source. It would have given a new dimension and a better understanding of the problems with the registration. The result part of the registration, section 5.1.2 Registration, is limited to the registration for users in Helsinki. For the other two ways to register there is not enough data collected. For this the additional quantitative source could have given answers. However, according to the case company's policies, no outsiders including the researcher can access this information because of its privacy policies.

### **6.3 Further research**

It is obvious that teachers need more information in the adoption of a new online learning environment. Parts of the applications were not utilized because of unclear concepts and because teachers did not know about them. When asked how they wanted to perceive the information, the teachers could not answer. How the information should be distributed to support the adoption and in what form needs further research.

In section 5.1.4 Technical Challenges, it was stated that there were differences in the use of the student key by teachers, teaching different grades. Another further research question is that should a different application be made for teachers teaching in different grades. It was also noted in the interviews that the students did not have problems with using digital

material. However, the adoption of the online learning environment is only considered from the teacher's point of view in this study. Observing and interviewing students using the online learning environment could give enriching data.

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## **Appendix A. Interview structure for teachers**

### ***Background questions:***

Which class do you teach?

How long have you been working as a teacher?

How long have you been using digital content in teaching?

Can you describe your computer skills?

Have you used the case company's other online learning environments?

### ***Computers in the school***

What kind of equipment do you have in your school?

Which technologies do you use?

Does the network connection in your school work?

### ***Adoption***

Why did you choose the case company's new online learning environment?

How and where did you hear about the new online learning environment?

How did you start using the new online learning environment?

Did you receive instructions?

Have you got any help?

Have you participated in any kind of training? Marketing event?

How did the registration proceed?

Was there any problem with the registration?

Did you start using the online learning environment voluntarily?

Does your school have any guidelines on how to use digital content in teaching?

How much time did it take to get acquainted with the new online learning environment?

### ***The online learning environment***

What digital content do you use in the online learning environment?

Have you paid for these?

Do you know what is free and what you have to pay for?

Is there any other material in the online learning environment you haven't used but familiarized yourself with?

What is your opinion on the digital content?

Have you used the folder box? How do you use it?

Have you used the drag and drop box? How do you use it?

Have you used the student key? How do you use it? How did you get the information hot to use the keys?

Do your colleagues use the new online learning environment?

Do you know what they feel about the online learning environment?

What do the pupils like about the online learning environment?

### *Usage*

How do you use the online learning environment?

How does it feel to use the online learning environment?

Is the online learning environment easy to use?

How does it feel to use digital content in teaching?

Have there been any problems with the online learning environment? What do you do when a problem occurs?

Do you know how to get help?

Do you know what kind of help the case company offers? Have you used it?

Have you got help from anybody else?

How often do you use the online learning environment? Digital content?

When do you use the online learning environment in teaching?

How much time do you spend on planning a lecture?

Does it take more or less time to plan the lecture when you use the online learning environment?

Do you use any other digital content / online services in teaching?